United States Department of the Interior
Bureau of Land Management – Las Cruces Field Office

Environmental Assessment

Copper Mountain South Pit Expansion Project

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Prepared by:
Bureau of Land Management
Las Cruces Field Office
1800 Marquess Street
Las Cruces, New Mexico

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ACRONYMS

%	percent
ABA	Acid-Base Accounting
ABP	Acid-Buffering Potential
ACEC	Area of Critical Environmental Concern
AGP	Acid-Generating Potential
amsl	above mean sea level
ANFO	Ammonium Nitrate Fuel Oil (bulk blasting agent)
ANP	Acid-Neutralization Potential
AVT	Ad Valorem Tax
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
CDNST	Continental Divide National Scenic Trail
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CR	County Road
dBA	A-weighted sound level in decibels
dBL	peak linear decibel level
DP	Discharge Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FY	fiscal year
HSRI	Human Systems Research, Inc.
kV	kilovolt
L_{10}	time-varying noise descriptor for 10 percent of the time
L_{90}	time-varying noise descriptor for 90 percent of the time
LCFO	Las Cruces Field Office (Bureau of Land Management)
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
MOU	Memorandum of Understanding
mph	miles per hour

ACRONYMS

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NM	New Mexico
NMAAQS	New Mexico Ambient Air Quality Standards
NMED	New Mexico Environmental Department
NMMMD	New Mexico Mining and Minerals Division
NMNHP	New Mexico Natural Heritage Program
NMWQCC	New Mexico Water Quality Control Commission
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PD	Phelps Dodge
PDTI	Phelps Dodge Tyrone, Inc.
PLS	pregnant leach solution
PM_{10}	particulate matter less than 10 micrometers
MPO/CCP	Mine Plan of Operation and Closure/Closeout Plan
ppm	parts per million
PVC	polyvinyl chloride
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
SCS	Soil Conservation Service
SE	state endangered
SH	State Highway
SOC	species of concern
SPCC	Spill Prevention Control and Countermeasure
SWPPP	Stormwater Pollution Prevention Plan
SX/EW	solution extraction/electrowinning
TDS	total dissolved solids
Tqm	tertiary monzonite porphyry intrusive
TSP	total suspended particulate matter
US	U.S. Highway
USDA	U.S. Department of Agriculture

ACRONYMS

USFWS	U.S. Fish and Wildlife Service
VRM	Visual Resource Management
WSA	Wilderness Study Area
$\mu g/m^3$	micrograms per cubic meters

1.1 NEED FOR THE PROPOSED ACTION

The proposed action is an expansion of the existing Copper Mountain Pit at the Tyrone Mine, located in Grant County, New Mexico, approximately 10 miles south of Silver City. The expansion is being proposed by Phelps Dodge Tyrone, Inc. (PDTI), which owns and operates the Tyrone Mine. PDTI is proposing to expand the current mine permit boundary to include an additional 74 acres adjacent to the southern boundary of the Copper Mountain Pit. The proposed pit expansion would occur on 31.1 acres within the expanded permit boundary. Map 1 shows the general vicinity of the project area and the proposed Copper Mountain South Pit Expansion. Land in the proposed pit expansion area includes 17.2 acres land owned by PDTI and 13.9 acres of public land under the jurisdiction of the Las Cruces Field Office of the Bureau of Land Management (BLM). PDTI owns the mineral rights of the land in their ownership; BLM controls both the surface land and the Federal mineral estate on the public lands. Map 2 indicates land ownership in the project area and vicinity.

In August 2004, PDTI submitted a Mine Plan of Operation and Closure/Closeout Plan (PDTI 2004) to the BLM and the New Mexico Mining and Minerals Division (NMMMD) that describes a plan for mining and reclamation in the pit expansion area. BLM is required to conduct an Environmental Assessment (EA) of the Mine Plan of Operation and Closure/Closeout Plan (MPO/CCP), and based on the results of the assessment, decide whether or not to approve the plan. BLM is responsible for making public land available for mineral development and to prevent any undue and unnecessary degradation of the environment. The EA will determine the potential significance of environmental impacts of the proposed action, and based on the results of the analysis, BLM will either issue a Finding of No Significant Impact (FONSI), or will require additional analysis to further evaluate the proposed action. In January 2005, PDTI submitted a short addendum to the MPO/CCP (PDTI 2005a) that corrected/clarified a few plan actions which made the plan consistent with other mine permit requirements.

The project is needed to mine recoverable copper ore from the expansion area, remove a historical leach stockpile at the site, and continue the use of leaching and processing facilities at the Tyrone Mine. It is estimated that the pit expansion would produce approximately 36 million tons of ore containing approximately 72 million pounds of recoverable copper. Mining could take up to 4 years to complete, depending on copper prices and mine economics. The project would allow the recovery of the copper ore and subsequent production of high quality copper cathode, the continued use of existing facilities at the Tyrone Mine, and provide work and income for mine workers. In addition to sustaining employment and income at the mine, the project would provide economic benefit to the local community, Grant County, and the State through the indirect benefit of employment and tax collection.

1.2 CONFORMANCE WITH LAND USE PLAN

The BLM Las Cruces Field Office manages public land within its jurisdiction under the general guidelines contained in the Mimbres Resource Management Plan (RMP) (BLM 1993). The Mimbres RMP provides a framework for managing and allocating resources on BLM land. It was written to meet the requirements of the Federal Land Policy and Management Act of 1976 (FLPMA) and the National Environmental Policy Act of 1969 (NEPA) for comprehensive land-use planning for public land.

SEE MAP 1

SEE MAP 2

BLM administers both surface land and Federal mineral estate on land within the Las Cruces Field Office area. The minerals program of the RMP describes management guidance for managing minerals on BLM-administered land. BLM policy is to make mineral resources available for location and development in accordance with the Mining and Minerals Policy Act of 1970, which requires the Federal government (including BLM) to facilitate mineral development to meet national, regional, and local needs.

As described in the RMP, it is also the policy and the responsibility of BLM to ensure that mineral development occurs in a manner that minimizes environmental damage. In order to accomplish this goal, BLM has classified lands within the district as being open to mineral development, or in some cases, has withdrawn land from mineral development for specific purposes such as flood control or to protect special conservation areas such as Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), or Wilderness or Wilderness Study Areas (WSAs).

BLM has reviewed the applicant's proposed action and found it to be in compliance with the guidelines and policies of the RMP and the 43 Code of Federal 3809 Regulations. The expansion area is located in an area open to mineral entry, adjacent to existing mining operations. PDTI has submitted a MPO/CCP to BLM and the NMMMD that meets BLM and State of New Mexico requirements. The approved MPO/CCP would prevent any undue or unnecessary degradation of the environment.

1.3 RELATIONSHIP TO STATUTES, REGULATIONS, OR OTHER PLANS

In addition to the need for the proposed action to conform with the Mimbres RMP, the Copper Mountain South Pit Expansion project would require authorizing actions from BLM and other Federal, State, and local agencies. BLM promulgated regulations under Title 43, Code of Federal Regulations (CFR), Section 3809 to implement the FLPMA requirements for mining activities on BLM-administered land. The Section 3809 regulations require BLM to approve a MPO/CCP submitted by an operator before the project can be implemented.

Before BLM can approve the plan, it must determine whether the action described in the plan would result in undue or unnecessary degradation of the environment. Mitigation measures needed to prevent undue degradation are required as conditions of approval. A determination as to the adequacy of the MPO/CCP will be made by BLM, based on the impacts identified in the EA and the requirements of the Section 3809 regulations. The EA has been prepared in compliance with NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508), and BLM's NEPA Handbook (H-1790-1).

The Section 3809 regulations require the operator to prepare a reclamation plan and to furnish financial assurance to insure that the reclamation is completed. The financial assurance is used to insure that the approved reclamation plan would be implemented should the operator be unwilling or unable to do so. The State of New Mexico also requires a reclamation plan and financial assurance. PDTI has submitted a MPO/CCP to the BLM and the NMMMD, which must meet both the State's and BLM's reclamation and financial assurance requirements. BLM and the State of New Mexico have an agreement that the applicant needs to submit only one reclamation plan that will be reviewed and approved by both agencies.

Occupancy of BLM administered public lands must also meet conditions described in 43 CFR Section 3715. These regulations govern the use and occupancy of public lands for mineral development by limiting such use to activities that are "reasonably incident" to the proposed mining activity. In general, this means that activities carried out by PDTI on public land must be for the express purpose of mineral development, and they must use methods, structures, and equipment appropriate for the mining and reasonably related activities. These regulations are meant to prevent any unnecessary and undue degradation of public lands as a result of implementing the proposed project. The MPO/CCP provides information on how PDTI would meet Section 3715 requirements, including on-the-ground verification of the proposed activity by BLM staff, protection of valuable minerals from theft, and protecting the public from surface uses, workings or improvements which could present a hazard to public safety. No permanent structures are planned for the project except for berms, open pits, signs and property fences that would be extended onto public land as required to restrict access to the mining areas and ensure the public safety. Fencing would also restrict cattle from the mine areas. Section 3715 also requires that the occupant of public land (PDTI) must conform to all applicable Federal and State environmental standards and that all required permits must be obtained before the beginning of occupancy.

The New Mexico Mining Act and other State and Federal legislation and regulations require that all operating mines apply for and maintain permits that govern a variety of resources. Table 1-1 lists the major permits required for the Copper Mountain South Pit Expansion.

Table 1-1
REGULATORY FRAMEWORK

Permit Name	Regulatory Agency	Purpose of Permit	Status
Stormwater/NPDES	USEPA	Protection of surface water – Clean Water Act	Issued 2/28/01
Groundwater Discharge Plans DP-166 and DP 1341	NMED	Operational and Closure Discharge Plans for Tyrone facilities required by NMWQCC regulations	DP-166 issued 12/16/97. Renewal pending. DP-1341 issued 4/8/03
Title V Permit No. P147	NMED	Air Quality Operating Permit for the Tyrone Mine	Current
Mine Plan of Operation/Closure Closeout Plan (MPO/CCP)	BLM	Operations on land administered by BLM (43 CFR 3809); Financial Assurance	Pending
	NMMMD	Compliance with NM Mining Act Rules, Permit GR010RE, Revision 04-1, Closeout Plan, New Units; Financial Assurance	Pending
MSHA ID # 29-00159	MSHA	Mine safety and training	Current

NMED: New Mexico Environment Department
NMMMD: New Mexico Mining and Minerals Division
NPDES: National Pollutant Discharge Elimination System
USEPA: United States Environmental Protection Agency
NMWQCC: New Mexico Water Quality Control Commission
NMEMNRD: New Mexico Energy, Minerals and Natural Resources Department

The process for obtaining an approved MPO/CCP was discussed above. The Closure/Closeout Plan must meet the BLM standards for reclamation and financial assurance. By Memorandum of Understanding (MOU), reclamation financial assurances are held by the State on behalf of both BLM and NMMMD. This is done to prevent "double bonding" for the same disturbance, since both agencies' regulations require reclamation financial assurance.

New Mexico Environment Department (NMED) Groundwater Discharge Permit No. 166 (DP-166) for PDTI was initially approved on July 20, 1981, and subsequently renewed and modified on July 20, 1986; July 20, 1991; and December 16, 1997. DP-166 was amended on January 22, 1999 to include the North Racket sump as a pregnant leaching solution (PLS) collection point. The latest DP-166 approval included 15 conditions and 13 specific requirements for operation, monitoring, contingencies, closure, and financial assurance (NMED 1997d) for several facilities that have the potential to affect groundwater quality, including the Copper Mountain Pit. DP-166 has since expired and PDTI has applied to NMED for its renewal. The renewal application includes the Copper Mountain South Pit Expansion.

DP-1341 was issued to ensure the closure plan for the Tyrone Mine (including the area of the Copper Mountain South Pit Expansion) addresses the discharge of water contaminants from the facility into ground and surface water after mining at the Tyrone Mine ceases. Supplement discharge permit for closure DP-1341 was issued by NMED on April 8, 2003.

2.1 PROPOSED ACTION

2.1.1 General Description

PDTI is proposing an expansion of the existing Copper Mountain Pit at the Tyrone Mine. The proposed pit expansion would be an extension of the existing Copper Mountain Pit and would be developed to continue the processing of copper-bearing ore by leaching the ore on existing stockpiles and subsequent solution extraction/electrowinning (SX/EW) of pregnant leach solution (PLS). The proposed project would be located on the southern edge of the Copper Mountain Pit on PDTI and BLM land (Map 2), in the SE ¼ of Section 21 and the NE ¼ of Section 28, Township 19 S, Range 15 W.

The Copper Mountain area has been a historic source of copper for over 120 years. Evidence of past mining exists throughout the area, and mining activities have occurred on land within the proposed Copper Mountain South Pit Expansion Project area prior to PDTI acquiring mining claims. PDTI began mining oxide ore from the Copper Mountain Pit in July 1990. Mining of the original Copper Mountain Pit was completed in February 1994. A small extension on private land along the south side of the Copper Mountain Pit was mined from April 2000 until January 2002. A total of 71 million tons of ore and 16 million tons of waste rock have been mined from the Copper Mountain Pit by PDTI. Total depth of the existing Copper Mountain Pit is 400 feet at an elevation of 6,000 feet above mean sea level (amsl). Mining is planned to go to a depth of 5,900 feet amsl in the main Copper Mountain Pit.

The copper mineralization within the proposed expansion area is predominantly copper oxide mineralization (e.g., *chrysocolla*) and is economically recoverable by acid leaching techniques, followed by processing via SX/EW to produce cathode copper.

Proposed activities for the Copper Mountain South Pit Expansion include:

- Layback of the southwest edge of the existing Copper Mountain Pit.
- Extension of an existing in-pit 46 kilovolts (kV) power line to provide power to an electric shovel.
- Removal of a historic leach stockpile left by previous operators.
- Placement of extracted ore on existing leach stockpiles.
- Placement of barren material on existing waste stockpiles or reclamation areas.
- Leaching of the ore on existing stockpiles to extract copper in PLS.
- Processing of PLS at the Tyrone SX/EW Plant and production of copper cathode.
- Use of existing PDTI mining and equipment facilities, including the truck shop, change rooms, water supply, electrical substation, power distribution system, etc. to support the mining of the pit.

There would be no new permanent development on site, except for berms, an open pit, fences with gates, and signs around the perimeter of the expansion area. Existing facilities and developments would be used to support mining of the proposed Copper Mountain South Pit Expansion. Temporary on-site development would include electric supply lines, water lines, and a

water fill-up station. Lights would be used on equipment in the pit and at the water fill-up station. No general pit lighting would be employed.

2.1.2 Surface Mine Operations

The proposed pit expansion would be developed from the existing Copper Mountain Pit and would be mined using conventional open pit mining techniques and equipment. A haul road would be extended from the 6,400-foot elevation of the Copper Mountain Pit and would curve downward as the expansion is mined. Based on the current mine plan, the expansion portion of the project would be mined such that a small portion of the expanded pit area would reach an elevation of approximately 6,000 feet. This would not be the low point in the Copper Mountain Pit, which will be approximately 5,900 feet.

Electric power would be extended into the expansion, as required, from existing power lines and electric power substations along areas previously mined by PDTI. There would be no additional disturbance of BLM land for the power or water lines. The existing Copper Mountain dewatering system, consisting of collection system, pumps, electric power supply, and pipeline, would be used to handle any pit dewatering that would be required. No chemicals, fuels, lubricants, or hazardous materials would be stored in the pit expansion area.

Before mining operations begin in the pit expansion area, a BLM and NMMMD approved fence will be constructed around the perimeter of the pit area to exclude the public and cattle from entering into an active mining area. The fence will be designed to minimize potential injury to wildlife, which may cross over or under the fence.

Material Stripping Techniques

The mine site is located in an area of rugged terrain with rock outcrops and minimal topsoil. In the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey of Grant County, New Mexico, the soils within the pit expansion area are identified as a combination of Disturbed Lands and of Santa Fe-Rock Outcrop Complex. Since topsoil is mostly nonexistent within the project area, no topsoil is proposed to be salvaged. Should salvageable amounts of topsoil be encountered during development, the material will be removed and stockpiled for use in final reclamation.

There would be no pre-production period. Approximately 36 million tons of ore would be extracted from the pit expansion along with approximately 27 million tons of barren rock.

Drilling Techniques

Blasthole drilling is accomplished using Bucyrus Erie 60R and 49R rotary drills. The rotary drills are crawler-mounted and drill 12.25-inch diameter holes. A drill pattern with an average of 27-foot spacing is used in most cases. Other spacing and special practices are utilized in areas requiring special consideration for pit slope stability or rock fragmentation.

Blastholes are drilled to develop benches with 50-foot heights based on ore control considerations and to allow for the effective use of drills and shovels. Subgrade drilling of 6 to 7 feet below the bench is considered to be adequate to permit digging and result in a smooth bench floor. Appropriate drill patterns would be designed to allow for adequate fragmentation of the rock.

Blasting Techniques

The blast hole size is dictated by explosive density and explosives used per ton of broken rock. An explosives contractor would load the blast holes with bulk blasting agent (ANFO) and delayed primer explosives that permit timing the sequence of initiation. The PDTI blasting crew would carry out all other blasting functions.

The supplier of the blasting agents would utilize their existing, safe storage facility on PDTI property. Transportation and storage of explosive materials would be conducted in a manner approved by all appropriate State and Federal regulatory agencies. There would not be an increase in explosive usage as a result of the development of the pit expansion.

Cuttings from the blastholes are sampled and assayed for determination of material type and copper grade. Material is designated as waste, leach ore, or low-grade leach. Blasting is done only during the day shift on a 5-day per week basis. A Tyrone Mine crew sleeves, primes, and stems the blastholes, and an outside contractor dewaters and pumps blasting agents into the holes. Blasting agents in use at Tyrone include emulsions, ANFO, and aluminized ANFO. Minor secondary blasting is required for boulders and hard bench toes.

Benching Techniques

Mining would proceed along benches that would be drilled and blasted to 50-foot heights. The width of the bench would be dictated by safety considerations and pit slope considerations. The width would allow for the safe operation of haulage trucks with safety berms. Flat surfaces such as bench tops and haul roads would be ripped and revegetated consistent with the MPO/CCP.

Load/Haul/Dump Techniques

Caterpillar trucks with the capacity to haul 190 to 250 tons would be loaded at the working face by an electric shovel. The trucks would haul each load of ore to the No. 2 leach stockpile system and each load of waste to the San Salvador Hill Pit. The No. 2 stockpile system includes the Nos. 2 and 4C stockpiles. Map 1 shows the location of the Nos. 2 and 4C stockpiles and the San Salvador Hill Pit.

Production

Mining would be conducted at an average extraction rate of between 40,000 to 90,000 tons per day.

Schedule and Periods of Operation

Mining in the proposed Copper Mountain South Pit Expansion is scheduled to begin when all applicable permits are received. Mining would be conducted at an average rate of between 40,000 to 90,000 tons of material per day. The pit expansion would produce approximately 36 million tons of ore containing approximately 72 million pounds of recoverable copper. Table 2-1 summarizes the general activities at the mine and the approximate time frame in which these activities would occur. Although the table indicates mining to be completed in 6 quarters, it could take up to 4 years to complete mining activities in the expansion area and would be

dependent on copper prices and mine economics. The mine would normally work two 12-hour shifts per day, 365 days per year.

Table 2-1
SCHEDULE OF MINING ACTIVITIES

Schedule	Activity	Tons of Ore Mined
Quarter 1	Drop cut to 6,350' and slot into existing pit area Mine 87% of 6,300' bench	2,860,000 4,330,000
Quarter 2	Finish 6,300' bench	650,000
Quarter 3	Mine all of 6,250' bench Mine 17% of 6,200' bench	5,600,000 940,000
Quarter 4	Finish 6,200' bench Mine 50% of 6,150' bench	4,530,000 2,660,000
Quarter 5	Finish 6150' bench Mine all of 6,100' bench	2,530,000 4,640,000
Quarter 6	Mine all of 6,050' bench Mine all of 6,000' bench	4,030,000 3,040,000

Mine Dust Control

In general, open pits associated with mines do not experience significant mixing of ambient air below the pit rim with the airflow above the rim. Consequently, control of fugitive dust generating activity below the rim would not be required. However, haul road fugitive emissions above the pit rim may contribute to off-site impacts. Continual watering would be applied to the haul road as the primary tool for controlling dust. Other substances, such as lignites, may be used for dust control. Actual substance used at any given time will be based on PDTIs commitment to minimize water use on the project, and the availability, cost effectiveness and dust-suppression capabilities of available materials. Haulage speeds would average approximately 15 miles per hour (mph) over the life of the project. Truck speeds would not exceed 33 mph. The maximum would only be attained when trucks are empty and on a flat road; speeds would be lower than average on other segments of the route (e.g., downhill empty, uphill empty, downhill loaded, and uphill loaded).

The proposed action would not require a modification to the existing permits or any additional air quality permit. Potential effects to air quality are from windblown particulate matter from the No. 2 stockpile and from mining operations. When the mine is in operation in this area, the wetting of access roads and haulage roads reduces dust generated from vehicular traffic. When leaching is in operation, the wetting of stockpiles with raffinate similarly reduces particulate emissions.

PDTI mining operations are currently in compliance with State and Federal air quality regulations and the proposed action would also be in compliance based on PDTI existing air quality permits.

Equipment Used On Site

Table 2-2 lists the equipment that would be used for mine production.

Table 2-2
EQUIPMENT REQUIREMENTS

Activity	Equipment
Loading	One Caterpillar 5230 hydraulic shovel or equivalent. One P&H 4100 electric mining shovel or equivalent.
Hauling	The existing PDTI haul truck fleet of Caterpillar trucks (190 and 250 ton capacity) would be used.
Drilling	The existing PDTI drill fleet would be used; the fleet consists primarily of Bucyrus Erie 49-R and 60-R drills.
Road Maintenance	The existing PDTI road maintenance fleet, consisting of motor graders and bulldozers would be used. Existing water trucks would be used for dust suppression on the haul roads.
Mine Mechanical Service	Existing mine service trucks, maintenance equipment, and maintenance shops would be used.
Mine Service and Supervision	No changes would be made in the level of mine services and supporting equipment as a result of implementing the Copper Mountain South Pit Expansion.

2.1.3 Processing Facilities

Ore that is extracted from the expansion area would be placed on an existing, permitted leach stockpile and stacked in appropriate lift heights to ensure optimal copper extraction. A drip emitter or spray irrigation system would be placed over the ore, and acidic solution would be percolated through the ore for an appropriate period of time.

Adequate leach stockpile capacity exists at Tyrone to handle the ore that would be mined from the pit expansion. The No. 2 leach stockpile system would be utilized for leaching this ore. The collection systems associated with these stockpiles would be used without modification. Leachable ore would be placed on the leach stockpiles in lifts up to 35 feet. Drip emitters or spray nozzles would deliver raffinate (an acid solution) solution recycled from the SX/EW plant. The raffinate would percolate through the stockpile for an appropriate period of time to extract the contained copper to form the PLS. The PLS would collect in the permitted collection systems where it would be pumped to the SX/EW plant for processing and subsequent copper recovery.

The PDTI SX/EW plant has a conventional flow configuration, with six extraction stages and four stripping stages. The solution extraction phase of the operation extracts copper from the PLS and concentrates it in an electrolyte solution that is pumped to the electrowinning tankhouse. In the tankhouse, copper is electrolytically plated onto thin copper sheets to produce high quality copper cathode.

Periods of Operation and Operating Hours

The mine and SX/EW plant normally work two 12-hour shifts per day, 365 days per year.

Dust Control

Drip emitters or spray nozzles are used to spray liquid raffinate solutions on the surface of the leach stockpiles to facilitate the leaching process. This action keeps the surface of the stockpiles

wet and prevents dust from being released from those areas under leach. The action of the leach solutions on the surface of the stockpiles causes a hard mineral crust to form once the surface has dried. The crust also prevents dust from being released from these surfaces.

Equipment Used On Site

One bulldozer tractor would be used for stockpile maintenance.

2.1.4 Waste Rock and Tailings Disposal

Approximately 27 million tons of barren rock would be placed in the San Salvador Pit (Map 1). The material that would be mined from the pit expansion would be predominantly non-acid-generating, therefore special handling methods are not necessary and the material should not pose any environmental concerns. The San Salvador Pit is currently partially backfilled with waste rock from the Tyrone Mine operations. The leached cap waste material from the Copper Mountain South Pit would not completely backfill the San Salvador Pit. Tailings disposal is not applicable to this project, as leaching does not produce tailings.

2.1.5 Access Roads and Utilities

Access to the pit expansion would be through the existing Tyrone Mine and Copper Mountain Pit. A haul road would be constructed from the existing operations into the pit expansion area as shown on Map 1. The largest vehicle that would use the haul roads is the 250-ton haul truck. All haul roads are designed to safely accommodate the largest vehicle to use it; therefore, the road would be built with a width of 120 feet, including appropriate safety berms, and road slope grades would be no greater than 10 percent. All other equipment included in the list of mine equipment may also use the roads. There would be no other access roads across Federal lands to the pit.

Electric power would be extended into the pit expansion area to operate the electric mining shovel. The utility line would be placed in previously disturbed areas along the proposed haul road into the pit.

Additional water would not be required for mining of the pit expansion. Changes to the current water supply distribution system or the existing water collection systems would not be required.

There would be no change to the existing sewage treatment system at PDTI, nor would there be an increase in sewage as a result of the development of the pit expansion. Solid wastes generated at PDTI would be managed by the existing PDTI facilities, following established procedures. Secure garbage containers would be placed near the site as necessary. Bulk refuse items would be sorted and disposed of in accordance with the current approved practice at PDTI. Non-mine waste disposal would not be allowed on the parcels and claims in this proposed MPO/CCP. Solid refuse would be removed from the affected lands and disposed of in accordance with the current approved practice at PDTI. PDTI holds a Solid Waste Permit issued by NMED.

2.1.6 Reclamation and Monitoring

The MPO/CCP for the proposed project describes the reclamation and monitoring plans that would be implemented with project approval. These plans are critical components of the regulatory requirements of both the BLM and the State of New Mexico. The main objectives of

reclamation are to stabilize and revegetate the site, protect water quality, minimize the potential for public hazard, and produce a site capable of supporting the approved post mining land use, which is wildlife habitat. Monitoring is required to meet the terms of the various mine permits, including the requirements for water quality monitoring as detailed in the mine Discharge Plan permits. More details of both the reclamation and monitoring plans can be found in the MPO/CCP for the Copper Mountain South Pit Expansion Project. A brief summary is provided below.

Reclamation includes revegetation of areas shown on Map 4 of this EA, and includes the pit bottom, flat bench areas, and mine roads not needed for continued access. Approximately 9 acres within the project area will be revegetated to support a wildlife habitat post mining land use. Table 4-1 in section 4.1-7 shows the seed mix to be used for the site, which includes only native species. Flat areas of the pit bottom will be covered with 36-inches of cover material and revegetated. Accessible flat bench areas will be ripped and/or covered with 24-inches of cover material and revegetated. Acid producing material is not expected to be an issue in the expansion area based on sampling and an understanding of the material at the site. If acid producing material is encountered during mining, it will be hauled to permitted leach stockpiles. During reclamation, this material will be covered with 36 inches of cover material and revegetated. Reclamation is planned to occur both during operations as appropriate, and final reclamation will be conducted in association with closeout activities at the Tyrone Mine. Revegetation success will be evaluated based on standards and requirements established for the Tyrone Mine.

Known underground openings in the project area are not within planned areas of disturbance. However, should any unknown structures of this type be encountered during mining, PDTI will notify both the BLM and the MMD. The NM Game and Fish Department will also be notified for their recommendations on surveys and mitigation that may be required to determine the possible presence of bats and measures to avoid impacts.

Monitoring will be done in compliance with permit requirements. The main components of monitoring are water quality and revegetation monitoring, and evaluating the success of establishing the post mining land use. Water quality monitoring is a requirement of the State of New Mexico Groundwater Discharge Permits. Monitoring sites include both groundwater wells and surface sampling locations. The Discharge Plans outline the water sampling schedules, protocol, and contingency requirements. Vegetation monitoring will occur during the third year after reclamation seeding and continue at least every other year and for two consecutive years prior to the release of the financial assurance. PDTI will document the post mining use of the area by wildlife, and will conduct deer pellet group counts and bird diversity surveys. Results will be evaluated to determine wildlife use trends.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the expansion of the Copper Mountain Pit would not occur. As shown on Map 2, BLM land is an integral part of the proposed expansion area; a no action decision by BLM would likely preclude economical mining of private land within the site. Approximately 36 million tons of ore, producing approximately 72 million pounds of copper, would not be mined, and the historic leach stockpile located in the expansion area would not be removed.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

During the planning process for expanded mining at the Copper Mountain Pit, several configurations of an expanded pit were considered. A smaller pit was determined to be uneconomic to mine and would leave economically accessible ore unmined. A larger pit configuration is not possible since the ore body is truncated by Deadman Canyon. The proposed action is a result of: the minimum size needed to make startup of mining economical; the extent of the ore body in the area; and the need to leave a buffer zone between the expanded pit and Deadman Canyon to prevent stormwater flows from entering the Copper Mountain Pit.

Alternative mining methods such as underground mining is not an economical method for mining the ore body at Copper Mountain. Processing facilities at the existing Tyrone Mine are available and other processing methods are not considered to be economic or an improvement over the existing process.

3.1 GENERAL SETTING

The Copper Mountain South Pit expansion is located at the southern edge of the Mangas Valley, in the foothills of the Big Burro Mountains in southwest New Mexico. This area is part of the Tyrone Mining District, where "modern" mining has occurred sporadically for more than 100 years, with the discovery of copper and turquoise deposits in 1871.

The expansion area is adjacent to the existing Copper Mountain Pit, which is part of the PDTI Tyrone Mine complex. Copper mineralization within the expansion area is primarily copper oxides, including chrysocolla, malachite, and azurite. Land ownership includes private land owned and/or controlled by PDTI, and land administered by BLM.

Land cover is a mosaic of mixed woodland and disturbed/successional areas that are comprised mostly of exposed rock, disturbed areas from past mining operations, and successional species such as snakeroot and lupine.

Elevation ranges from about 6,100 to 6,400 feet, and annual rainfall averages between 17.3 and 20.6 inches. The site is located within the Deadman Canyon Watershed, which has a basin area of approximately 6.21 square miles with no perennial surface water flow. Regional groundwater ranges from a sodium-calcium-bicarbonate to calcium-sulfate type water. The shallow alluvial groundwater was impacted historically by seepage from Copper Mountain leach stockpiles. Water quality monitoring data collected by PDTI since 1998 has shown a general improvement in water quality (PDTI 2005b).

The proposed pit expansion would not impact any Areas of Critical Environmental Concern, Special Management Areas, Prime or Unique Farmlands, floodplains, Wild and Scenic Rivers, Wilderness Areas, or Wilderness Study Areas.

3.2 AFFECTED RESOURCES

3.2.1 Lands and Access

Land Jurisdiction and Management

The project area is located in Grant County, New Mexico, approximately 10 miles south of the town of Silver City. Lands in the general vicinity of the project include lands managed by BLM, the Gila National Forest, and State and private lands. The pit expansion would involve approximately 31.1 acres, of which 13.9 acres are BLM land and 17.2 acres are private lands owned by PDTI. Map 2 shows land ownership in the project area.

BLM administers land in its jurisdiction based on the general guidelines and policies set forth in the Mimbres RMP (BLM 1993). Public land is managed using the general principles of multiple-use management, which means BLM manages the public lands in a combination of ways that best meets the needs of the country. Allowed uses may include diverse activities such as recreation, wildlife management, cultural preservation, grazing, and mining. In the Mimbres RMP, the area of the pit expansion is located in an area open for mineral development.

Grant County has an approved Comprehensive Plan (Grant County 1994) that presents guidelines and policies for managing land use in the county. The plan covers a variety of topics,

including cultural preservation, environmental protection, and economic development. Goals of the plan are to provide economic opportunities for residents of the county and also to protect the county's natural resources.

Existing Land Use

The pit expansion is adjacent to, and continuous with, the existing Copper Mountain Pit. Past and ongoing mining operations, including the Tyrone and Little Rock mines, influence land use in the vicinity of the proposed action. Land within the expansion area has been used for exploration purposes, and has been influenced by past mining operations including a leach stockpile and several old mine roads. The closest residences to the project area include a ranch residence located approximately 1.5 miles to the southwest in T10S, R15W, Section 29, and another ranch residence 2.2 miles to the northeast in T19S, R15W, Section 8.

Recreation

The primary recreational opportunities in the area surrounding the project site are dispersed activities such as hunting, hiking, rockhounding, horseback riding, camping and picnicking, and off-road vehicle use. Most of recreation activities take place on the Gila National Forest, located approximately 0.5 miles west of the pit expansion area. BLM land involved in the proposed pit expansion is an isolated parcel of public land not connected to a major public use area; consequently public recreation use is limited. A primitive road through Deadman Canyon can provide access to BLM land, but use of the area for dispersed recreation activities is very low, and generally limited to an occasional deer hunter during the fall hunting season.

A section of the Continental Divide National Scenic Trail (CDNST) is located approximately 0.5 to 1 mile south of the pit expansion area. The trail is accessed from Forest Road 136, and runs south to Burro Peak and ends at the junction of Forest Road 828 and State Highway (SH) 90. There are no other existing, proposed, or potentially designated parks, campgrounds, wilderness or primitive areas, or other special recreation use areas in or immediately surrounding the pit expansion area.

Access

The transportation system in the general area includes U.S., State, County, Forest Service, and private roads. U.S. Highway 180 (US 180) is a major north-south arterial that serves the Silver City area. SH 90 provides access from the Tyrone Mine north to Silver City or south to Lordsburg. The Mangas Valley Road is a Grant County road providing access to the Mangas Valley between US 180 and SH 90. Forest Road 136 is an improved dirt road that provides access to the Gila National Forest and private land inholdings just south of Tyrone Mine and the proposed pit expansion area.

Access into the expansion area would be through the existing Copper Mountain Mine on PDTI property. The MPO/CCP calls for the haul road to be extended from the 6,400 elevation of the existing Copper Mountain Mine down into the pit expansion as the pit is mined. Mined material, both ore to be leached and waste rock to be disposed of, would be transported on the haul road and other existing mine roads within the Tyrone Mine.

3.2.2 Geology and Minerals

General Geology

The copper deposit in the pit expansion area is located along the northeast flank of the Big Burro Mountains, which are a north-south trending range in the Basin and Range physiographic province of New Mexico. The major geologic unit of the expansion area is tertiary intrusive rock composed primarily of quartz monzonite porphyry intrusives (Tqm). Quartz monzonite is generally a medium light gray, medium-grained, hypidiomorphic-granular rock, and comprises the largest part of the Tyrone stock. Exposed rocks in the area are primarily igneous and sedimentary ranging from Precambrian to Quaternary in age.

Geologic mapping of the area also shows several fault systems characterized by high angle faults exhibiting normal component of movement (Hedlund 1978). Field evidence suggests the occurrence of episodic movement along these faults as late as the Quaternary period. The Burro Chief Fault bisects the expansion area on a southwest to northeast trending line in the northern part of the expansion area. Map 3 displays the general geologic unit within the pit expansion and a mineralogy cross section through the pit.

Mineralization and Rock Characterization

Mineralization in the Copper Mountain area appears to be structurally controlled, with the primary mineralization having occurred by the emplacement of hot fluids ascending from an intrusive source at depth. These fluids penetrated the more permeable fracture zones and then precipitated minerals as the fluid cooled, a process known as hypogene mineralization. This process results in ore minerals in the oxidized zone being associated with fractures, veinlets, and also as disseminations within the rock. The copper mineralization within the proposed pit expansion area is primarily copper oxides, including chrysocolla, malachite, and azurite.

The ore and waste material that would be mined from the pit expansion would be predominantly non-acid-generating copper oxides. According to the geologic model for the pit expansion, 36 percent of the material mined would be leach capping, 10 percent would be old stockpile, 54 percent would be oxide copper ore, and 0.01 percent would be mixed oxide-sulfide.

The composition of leach capping is predominately iron oxides with no visible sulfides and very low-grade copper mineralization. It is a net-neutralizing material that is non-acid-generating. The oxide copper minerals are chrysocolla, malachite, and azurite, which are soluble in sulfuric acid, have no visible sulfides and contain leach-grade copper mineralization. It is a net-acid-neutralizing material that is acid consuming by nature.

The mixed oxide-sulfide material is composed of copper oxide minerals and chalcocite-pyrite minerals. It is a transition zone material that contains both oxide to sulfide minerals as well as leach-grade mineralization. This material composes 0.01 percent of the material to be mined and would be placed on an existing leach stockpile along with the rest of the oxide ores that are to be mined. None of the waste contains mixed oxides/sulfides.

SEE MAP 3

Acid-Base Accounting (ABA) analyses were performed on exploration hole pulp samples from holes that are located in the area where the final pit wall would be and on representative samples of the mined material. The Acid-Buffering Potential (ABP) is the difference between the Acid-Neutralization Potential (ANP) and the Acid-Generating Potential (AGP) and is a means of assessing the potential for acid generation or neutralization of the mine materials. A standard method (U.S. Environmental Protection Agency [EPA] Method 600) was applied to assess these characteristics of the rock.

Four exploration drill holes were sampled at a total of 15 depth intervals and sent for analytical characterization. The samples were chosen based on the proximity to the planned pitwall and for representative mineral types that are expected to occur there with the exception of one sulfide sample. Although no sulfide is expected to be encountered in the final pitwall, one sulfide sample was also submitted for analysis. The analytical results are provided in Table 3-1.

Table 3-1
ACID-BASE ACCOUNTING RESULTS

Mineral Type	Hole ID	Sample Interval	ABP EPA600	AGP EPA600	ANP EPA600
1	CG-02	6-16	5.4	0.9	6.3
1	CG-02	196-206	13	<0.3	13
1	CG-02	276-286	8.3	<0.3	8.3
1	CF+100-02+90	28-38	10.4	<0.3	10.4
1	CF+100-02+90	98-108	<0.3	<0.3	<0.3
1	CF+100-02+90	168-178	6.5	<0.3	6.5
1	CF+100-02+90	278-288	7.8	<0.3	7.8
1	CE-4	133-143	46.7	<0.3	46.7
2	CG+75-2	0-6	4.2	<0.3	4.2
2	CG+75-2	36-46	7.3	<0.3	7.3
2	CG+75-2	76-86	39.9	<0.3	36.9
2	CE-4	23-33	9.3	<0.3	9.3
21	CG-02	46-56	4.9	<0.3	4.9
21	CE-4	83-93	4.2	<0.3	4.2
6	CF+100-02+90	358-368	16.1	5.6	21.8

Mineral Type	Mineralogy	Description
1	Leached capping	Iron oxides
2	Green copper oxides	Chrysocolla+/- malachite, +/- azurite
21	Black copper oxides	Copper WAD, neotocite, tenorite, manganese oxides
6	Chalcopyrite-pyrite	Chalcopyrite and pyrite

All of the oxide mineral types tested show a strong net neutralizing potential (ANP) with a ratio of ANP to AGP much greater than 3 for all samples except one which also did not have any measurable AGP. ABP values range from zero (no AGP or ANP detected, one sample) to 46.7 T_{CaCO3} per 1,000 T (46.7 tons calcium carbonate per 1,000 tons of rock) and tend to increase with depth. The sulfide sample analysis yielded an ABP of 16.1 T_{CaCO3} per 1,000 T (ANP to AGP ratio of 3.9). The sulfide mineralogy is also net neutralizing and has a low overall sulfur content.

The neutralizing capability of the rock can be explained by the original hypogene mineralization. Generally, hypogene mineralization within this area has a low sulfide content, has a high chalcopyrite to pyrite ratio, and is associated with calcite. These are the main reasons that an oxide ore body has formed here instead of a sulfide ore body and why the material has neutralizing potential. Overall, the material has an excess of neutralizing potential, as witnessed by the remaining buffering potential within the oxide mineral types.

Seismicity

Seismic activity in New Mexico generally occurs along the Rio Grande Rift, primarily extending from Socorro northward to the Los Alamos area. The pit expansion area is located in the Basin and Range physiographic province, which is typified by low seismic activities and long recurrence intervals. The Datil-Mogollon Volcanic Field is located north of Copper Mountain. Earthquake magnitudes in the region have typically been less than 4.

There are several faults in the area with known displacement during the Quaternary; the age of the youngest known displacement is less than 500,000 years. Based on historic earthquake activity, surface rupture patterns, and an evaluation of geologic evidence, a maximum magnitude earthquake of 7.3 has been determined for the area (Algermissem et al. 1982; Nakata et al. 1982; Sanford et al. 1981).

3.2.3 Soils

The soils in the project area have been mapped by the Natural Resources Conservation Service (NRCS; formerly SCS) and the U.S. Forest Service, and are presented in the Soil Survey of Grant County, New Mexico-Central and Southern Parts (SCS 1983). The soil units in the immediate vicinity of the proposed pit include Santa Fe-Rock outcrop complex with 20 to 45 percent slopes and Santana-Rock outcrop with 1 to 25 percent slopes. The other map unit in the proposed pit area is the Pits-Leach Stockpiles-Disturbed Land unit, which includes leach stockpiles and mine waste remaining from earlier mining operations at the site. Table 3-2 presents physical and chemical data on these soil map units within the project area boundary.

The Santa Fe-Rock outcrop complex, 20 to 45 percent slopes, occurs on hills, mountains, and ridges. This unit is approximately 55 percent Santa Fe gravelly sandy loam and 25 percent rock outcrop. The Santa Fe soil is shallow, well-drained, and formed in residuum derived dominantly from igneous rock. Typically, the surface layer is a 2-inch-thick, dark brown gravelly sandy loam. The subsoil is a 14-inch-thick, dark brown very gravelly loam and very gravelly clay loam. Bedrock of weathered igneous rock is typically at a depth of approximately 16 inches.

Permeability is moderate (0.6 to 6.0 inches per hour), while the available water capacity is very low (0.07 to 0.13 inches). The effective rooting depth is 8 to 20 inches. Runoff is medium, the hazard of water erosion is moderate, and the hazard of soil blowing is high. Rock outcrop consists of barren or nearly barren exposures of granite bedrock. Native vegetation in this unit is mainly piñon-juniper and grasses (USDA 2003).

Table 3-2
PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS IN PROJECT AREA[1]

NRCS Map Unit Number	46	60	63
Soil Name	Pits-Leach Stockpiles-Disturbed land	Santa Fe-Rock outcrop	Santana-Rock outcrop
Texture	N/A	gravelly sandy loam, very gravelly loam, very gravelly clay loam	loam, gravelly loam, sandy clay loam, loam
% Slope	N/A	20 to 45	1 to 25
Rock and Gravel (% volume)	N/A	0 to 10	0 to 10
Clay %	N/A	15 to 35	10 to 30
Depth to Bedrock (inches)	N/A	8 to 20; typically weathered bedrock at 16	4 to 18; typically unweathered bedrock at 12
Organic Matter (%)	N/A	N/A	1 to 2
Water Erosion Hazard	N/A	moderate	moderate
Wind Erosion Hazard	N/A	high	moderate
pH	N/A	6.1 to 7.8	6.1 to 7.8
Electrical Conductivity (Mmhos/cm)	N/A	<2	<2
Permeability (in/hr)	N/A	0.6 to 6.0	0.6 to 2.0
Available Water Capacity (in/in)	N/A	0.07 to 0.13	0.12 to 0.18
Subgroup Classification	N/A	Lithic Argiustolls	Lithic Haplustolls

[1]Source: SCS 1983 N/A: Data not available.

The Santana-Rock outcrop, 1 to 25 percent slopes, is a shallow, well-drained soil that occurs on hills and ridges. The unit is 45 percent Santana loam and 40 percent rock outcrop. The Santana soil is formed in residuum derived dominantly from granite. Typically the surface layer is about 8 inches thick and consists of dark grayish brown loam. The approximately 4-inch-thick substratus is dark grayish brown gravelly loam. Granite bedrock occurs at a depth of about 12 inches in non-outcrop areas.

Permeability of the Santana soil is moderate (0.6 to 2.0 inches per hour), while the available water capacity is very low (0.12 to 0.18 inches). The effective rooting depth is 4 to 16 inches. Runoff is medium, and wind and water erosion hazard is also moderate. Rock outcrop consists of barren or nearly barren exposures of granite bedrock. The native vegetation is mainly shrubs and grasses (USDA 2003).

Within the project area, soils are subject to high wind and/or water erosion. These soils, when disturbed (or vegetation is removed), may have significant increases in soil erosion rates. The Santa Fe-Rock outcrop soil has high wind and moderate water erosion hazard potential, and this soil covers the majority of the project area.

3.2.4 Water Resources

Hydrometeorology

Sources of climatological data include several sites within the Tyrone Mine and from stations managed by the U.S. National Oceanographic and Atmospheric Administration. Annual rainfall in the region ranges from 8.3 to 25.8 inches, with averages between 17.3 and 20.6 inches for sites with more complete data records (BLM 1997). Elevation has a significant influence on precipitation with the higher elevations receiving the greater amount of rainfall. Almost half of the yearly rainfall comes in the July to October time period and corresponds to the "monsoon season" when moist air from the Gulf of Mexico is brought up into the southwestern United States. Precipitation occurs mostly as brief but occasionally heavy thunderstorms.

Temperatures are also influenced by elevation, with an increase in elevation corresponding to lower temperatures. Records at the Tyrone Mine indicated average daily low temperatures are slightly below freezing during the winter months (November through February) and average maximum temperatures exceed freezing year-round. Summer maximum temperature in July and August average in the upper 80 degrees Fahrenheit. Average annual evaporation is approximately 92 inches a year and exceeds average monthly rainfall for all months of the year.

Surface Water

The pit expansion is located in the Deadman Canyon Watershed. Deadman Canyon has an alluvial sandy bed, which is subject to downcutting and gullying in its upper reaches. Deadman Canyon has no perennial surface water flow. Springs in the watershed are small and flow at the ground surface for very short distances. Cumulative flows from all of the springs and seeps do not have a significant effect on the hydrologic budget of the watershed.

The canyon has a basin area of approximately 6.21 square miles with an average channel slope of about 7 percent. Maximum elevation of the drainage is 8,020 feet, and the outlet elevation is about 5,620 feet. There are approximately 3 square miles of the basin located above the area of the proposed pit expansion.

The storm flow from a 100-year, 24-hour storm of 3.69 inches rainfall was estimated using Deadman Wash basin and rainfall information in a HEC-1 Model. The estimated 100-year stormflow is 1,400 cfs for a location in the canyon 1.5 miles downstream of the Copper Mountain Pit expansion (BLM 1997). This flow rate is greater than the storm flow that would be estimated for a point higher in the canyon, near the Copper Mountain South Pit expansion area. The mean annual stormwater runoff (0.27 inches/year) was estimated using synthetic streamflows based on data from the White Signal rain gage, which is 12 miles south of the site.

Several seeps upgradient and downgradient of the proposed pit expansion were sampled in 1994 (Map 4). Upgradient surface water sample location DC-1, located approximately 1 mile upstream of the Copper Mountain site, exhibited total dissolved solids (TDS) and pH values ranging from 168 to 206 parts per million (ppm) and 6.31 to 7.56, respectively. Seeps named Seep-2 Lower, Seep-3, and Seep-4 are located down-canyon and downgradient of the northern boundary of the proposed pit expansion area. The TDS and pH of these springs ranges from 2,700 to 4,500 ppm and 3.64 to 3.97 respectively. These seeps also exceed New Mexico Water Quality Control Commission (NMWQCC) standards for aluminum, cobalt, and copper. These

seeps discharge water of lower quality compared to the water quality at DC-1, and may be influenced both by historic (prior to Phelps-Dodge) heap leaching operations on Copper Mountain and by natural mineralization.

Further down-canyon, at Seeps 5 and 5E, water quality improves; TDS and pH that range from 420 to 1,800 ppm and 3.90 to 6.36, respectively. However, these seeps also exceed NMWQCC standards for aluminum, cobalt, and copper. Water samples of Deadman Creek at DCWC-1 (approximately 3 miles down-canyon from the expansion area), show TDS and pH range from 234 to 274 ppm and 7.40 to 7.62, respectively, for January and March 1994. No NMWQCC standards were exceeded at this location. Since this sample location is below the confluence with Whitewater Creek, the water quality is not derived solely from Deadman Creek Watershed conditions.

Groundwater

Regional Groundwater

Regional groundwater in the project area occurs primarily within the Tertiary igneous rocks and flows generally to the northeast, toward the Tyrone Main Pit. The hydraulic gradient is approximately 6 percent. Depth to the groundwater in the Deadman Canyon drainage is typically about 50 to 100 feet below ground surface. On the ridges and hills around the Deadman Canyon, the depth to groundwater can be several hundred feet. The groundwater level in the Copper Mountain Pit is approximately at the existing pit bottom. Recharge to the regional groundwater system primarily comes from infiltration of snowmelt and rainfall events through bedrock fractures.

The background regional water quality in the project area ranges from sodium-calcium-bicarbonate type to calcium-sulfate type water. Analytical results from regional aquifer monitoring wells TWS-8, 9, 41, and 42 installed in Deadman Canyon (Map 4) indicate that the groundwater meets NMWQCC standards, except for chromium at TWS-9.

Downgradient of the mineralized area around the Little Rock Pit, and the former heap leaching operations near that pit, water quality is relatively good – only concentrations of copper and manganese exceed NMWQCC standards.

Regional groundwater is used for domestic, livestock, irrigation, and mining purposes. There are, however, no current groundwater users in Deadman Canyon other than PDTI.

Alluvial Groundwater

A relatively thin, shallow groundwater system is present in the alluvial sediment of Deadman Canyon. This shallow system is "perched" on top of the less permeable bedrock. The depth to groundwater in this perched alluvial system ranges from a few feet to approximately 20 feet. Flow in the alluvium is to the north, along the trend of the Deadman Canyon drainage. Recharge to the alluvial aquifers is seasonal and derived from infiltration of surface water. Alluvial groundwater levels vary widely seasonally. The alluvial aquifer is capable of providing only small sustained yields to wells. No known alluvial groundwater users exist in the Deadman Creek Watershed.

SEE MAP 4

Water quality trends from a calcium-bicarbonate-sulfate type in the south to a calcium-sulfate type in the north. The alluvial groundwater system was impacted historically by seepage from the Copper Mountain leach operation (operated by a company other than Phelps Dodge) as well as seepage from the Nos. 2 and 2A stockpiles.

Phelps Dodge installed numerous seepage capture systems to address these issues and also reclaimed the historic leach operation operated by others. Consequently, the water quality in the shallow alluvial system has substantially improved over time since these corrective actions were implemented.

The shallow ground water monitor wells that are located immediately adjacent to Deadman Canyon in the project area include monitoring wells nos. TWS-33, TWS-34, TWS-32, and TWS-36 (from south to north) as shown on Map 6. Based on the water quality data for these wells (PDTI 2005b), water quality has generally improved since 1998 in these shallow wells. These wells all meet the NMWQCC regulation standard for TDS (1000 mg/L) as well as other constituents.

3.2.5 Air Quality

Climatology and Meteorology

The project site is located approximately 10 miles south of Silver City, in southwest New Mexico. Weather data is collected at the Fort Baynard, New Mexico, National Weather Service Station, located approximately 10 miles northeast of Silver City, or approximately 20 miles from the project site. Data from this station is considered to be generally representative of conditions at Copper Mountain.

This area has a dry desert climate, with average annual precipitation of approximately 15.7 inches, with July and August being the wettest months. Annual snowfall is approximately 10.4 inches, falling mostly between December and March. Average maximum temperature varies from 52 degrees Fahrenheit in December and January to 87 degrees Fahrenheit in June and July. Average minimum temperatures vary between 25 degrees Fahrenheit in January and 58 degrees Fahrenheit in July.

Surface winds tend to be influenced by two separate air masses during the course of a year. From mid-June to October, a maritime tropical air mass, associated with a subtropical high-pressure system, produces southeasterly winds that typically are moderate, but can be strong in advance of thunderstorms. During the winter months, the subtropical high-pressure system moves south, allowing the continental polar air mass to move southward. The polar air mass is associated with frontal systems and generally produces northwesterly winds. Spring is the windy season in this part of New Mexico, and although wind direction tends to be from the northwest, they can be variable and blow from any direction.

Air Quality

Attainment status for pollutants within the project area is determined by monitoring levels of criteria pollutants for which National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS) exist. The criteria pollutants for which Federal standards exist are carbon monoxide, lead, sulfur dioxide, particulate matter less than 10

micrometers in size (PM_{10}), ozone, and nitrogen dioxide. State standards must incorporate these pollutants, but the State may also establish additional ambient air quality standards for other pollutants. The applicable standards are presented in Table 3-3.

Table 3-3
AIR QUALITY STANDARDS

Pollutant	Averaging Period	New Mexico Standards	National Standards	
			Primary	Secondary
Carbon monoxide	1-hour	13.1	40,000 ug/m^3 (35 ppm)	---
	8-hour	8.7	10,000 ug/m^3 (9 ppm)	---
Lead	Calendar quarter	---	1.5 ug/m^3	1.5 ug/m^3
Sulfur dioxide	3-hour	---	---	1,300 ug/m^3 (0.5 ppm)
	24-hour	0.1	365 ug/m^3 (0.14 ppm)	---
	Annual	0.02	80 ug/m^3 (0.03 ppm)	---
PM_{10}	24-hour	---	150 ug/m^3	150 ug/m^3
	Annual	---	50 ug/m^3	50 ug/m^3
$PM_{2.5}$	24-hour	---	65 ug/m^3	65 ug/m^3
	Annual	---	15 ug/m^3	15 ug/m^3
TSP	24-hour	150 ug/m^3	---	---
	7-day	110 ug/m^3	---	---
	30-day	90 ug/m^3	---	---
	Annual	60 ug/m^3	---	---
Ozone	1-hour	---	235 ug/m^3 (0.12 ppm)	235 ug/m^3 (0.12 ppm)
Nitrogen dioxide	24-hour	0.10 ppm	---	---
	Annual	0.05 ppm	100 ug/m^3 (0.05 ppm)	100 ug/m^3 (0.05 ppm)
Hydrogen sulfide	1-hour	0.01 ppm	---	---
Total reduced sulfur	½-hour	0.003 ppm	---	---

Source: EPA website: www.epa.gov/airs/criteria.html, New Mexico ambient air quality standards (NMAC Title 20, Chapter 2, Part 3) downloaded from New Mexico website: www.nmenv.state.nm.us/ Common/regs_idx.html

PM = particulate matter

ppm = parts per million

TSP = total suspended particulates

ug/m^3 = micrograms per cubic meter

EPA designates areas of the United States with regard to NAAQS. Areas that record air pollutant concentration levels lower than the NAAQS are classified as attainment. Areas that record pollutant concentration levels higher than the NAAQS are classified as non-attainment. EPA considers areas that are unclassified, with respect to NAAQS, as attainment areas for regulatory purposes.

New Mexico has attainment/non-attainment designation with regard to five pollutants: total suspended particulate matter (TSP), sulfur dioxide, carbon monoxide, nitrogen dioxide, and ozone. The area around the pit expansion is designated as unclassified, with one exception. The existing Hurley Smelter, located approximately 15 miles east of the project area, is classified as non-attainment for sulfur dioxide in a 3.5-mile radius around the facility. The State of New Mexico has requested that the Hurley Smelter area be redesignated as attainment.

Due to the type of project activities and possible effect on air quality, inhalable particulate, or PM_{10}, is the criteria pollutant of greatest concern for the proposed pit expansion. EPA has recorded monitoring data for the region near Tyrone, New Mexico. Monitoring data for PM_{10} for the last 3 years with complete records is provided in Table 3-4. The data from the Hurley Station is considered as representative of the Copper Mountain area based on its proximity to the proposed project and proximity to similar mining operations.

Table 3-4
MONITORED PM_{10} DATA (ug/m^3)

Station	Year	Number of Samples	1st Maximum 24-hour	2nd Maximum 24-hour	Annual Mean
Cobre	1998	62	35	33	18.4
(Monitor ID 350170001811022)	1999	60	48	43	21.5
	2000	58	44	34	19
Hurley	1998	58	35	29	16.5
(Monitor ID 350170009811021)	1999	58	51	48	19.5
	2000	57	38	33	16.4
Silver City	1998	56	34	33	17.8
(Monitor ID 350170002811021)	1999	59	52	48	20.7
	2000	58	48	43	19.2

EPA AIRData Website: www.epa.gov/aqspubl1/air_quality_tables.html

ug/m^3 = micrograms per cubic meter

PM_{10} = particulate matter less than 10 micrometers in size

3.2.6 Noise

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity. The method commonly used to describe and quantify environmental noise consists of evaluating all frequencies of sound according to a weighting system that reflects the characteristics of human hearing. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA).

A-weighted sound levels can adequately indicate the level of noise at any instant in time, but community noise constantly varies, and most environmental noise includes a conglomeration of noise from distant sources that creates a relatively steady background noise. To reflect this situation a single descriptor called the L_{eq} (equivalent sound level) is used. L_{eq} is the energy-mean A-weighted sound level during a measured time interval and is the "equivalent" constant sound level that would have to be produced by a given source to equal the fluctuating level measured.

To describe the time-varying character of noise, statistical noise descriptors such as L_{10} or L_{90} are used. They are noise levels equaled, or exceeded during 10 or 90 percent of the time, respectively. L_{10} sound levels typically describe transient, or short-term events, while levels associated with L_{90} describe the steady-state condition. Day-night average sound level (L_{dn}) describes the A-weighted average sound level for a 24-hour day. It is calculated by adding a 10-decibel penalty to sound levels in the night (10 p.m. to 7 a.m.) to account for the higher sensitivity to noise during the nighttime hours. The L_{dn} is typically 6 dBA higher than the 24-hour L_{eq} because of the nighttime weighting factor.

Noise in the surrounding area has not been monitored, however, ambient noise levels typical of remote mining areas are around 30 L_{90} dBA (BLM 1997). At the Copper Mountain South Pit Expansion, the closest residence is located to the southwest in Section 29, T19S, R15W, more than 7,900 feet (1.5 miles) away. The second closest receptor is a ranch residence located to the northwest in Section 8, T19S, R15W, more than 2 miles distant from the pit expansion. The closest community is Tyrone, located approximately 6 miles to the northeast. There is intervening topography between the proposed pit expansion and the two residences. The community of Tyrone is north of the Little Burro Mountains, which are located north of the Tyrone Mine and the proposed pit expansion.

3.2.7 Vegetation

The following section describes vegetation resources that are known to occur or have the potential to occur in the vicinity of the expansion area. Impacts to native vegetation at the Tyrone Mine from past mining activities range from relatively minor disturbances to denuded habitat. General habitat characteristics appear relatively intact in areas where no mining activity has occurred.

Several biological surveys have been conducted at the Tyrone Mine. The most recent assessment occurred in September 2002 during a 2-day site visit by a URS Corporation biologist. Other surveys include assessments during site visits by Dames & Moore environmental staff in 1994 and 1995, and threatened and endangered flora and wildlife surveys conducted by the Metric Corporation in 1993 and 1996. Biological data for the area have also been collected by public agencies including U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service, New Mexico Department of Game and Fish, and the New Mexico Natural Heritage Program (NMNHP) (BLM 1997).

The expansion area is primarily composed of three vegetation communities: disturbed/ successional, mixed woodland, and disturbed/mixed-woodland mosaic. Table 3-5 displays the acres of the different vegetation types, by land ownership. No wetlands or riparian areas were identified within the project area.

The disturbed/successional community is characterized by large areas of exposed rock and human developments caused by past mining activities, including a leach pad and access roads. The more vegetated portions of the community are dominated by plumed brickellia (*Brickellia brachyphylla*), Rothrock's snakeroot (*Eupatorium rothrockii*), Wright's snakeroot (*Eupatorium wrightii*), Dakota mock vervain (*Glandularia bipinnatifida*), and silvery lupine (*Lupinus argenteus*).

Table 3-5
VEGETATION COMMUNITY TYPES

Community Type	Acres			Percent of Total		
	BLM	PDTI	Total	BLM	PDTI	Total
Disturbed/Successional	0.7	3.5	4.2	2.3	11.2	13.5
Mixed Woodland	6.5	1.7	8.2	20.9	5.5	26.4
Mosaic	6.7	12.0	18.7	21.5	38.6	60.1
Total	13.9	17.2	31.1	44.7	55.3	100

BLM = U.S. Bureau of Land Management
PDTI = Phelps Dodge Tyrone, Inc.

The mixed woodland community dominates the southern portion of the proposed expansion area on a predominately north-facing slope. This community is dominated by woody species including point-leaf manzanita (*Arctostaphylos pungens*), Utah fendlerella (*Fendlerella utahensis*), alligator juniper (*Juniperus deppeana*), beargrass (*Nolina microcarpa*), piñon pine (*Pinus edulis*), ponderosa pine (*Pinus ponderosa*), Emery oak (*Quercus emoryi*), and gray oak (*Quercus grisea*).

The disturbed/mixed-woodland mosaic community is the largest community. Disturbed areas are primarily a result of previous mining and exploration activities characterized by roads cut through the woodland community. Dominant species are similar to those in the disturbed/ successional and mixed woodland communities.

Noxious Weeds

Both Federal and State governments have regulations concerning noxious weeds. Executive Order 13112, signed February 1999, requires Federal agencies, whose actions may affect the status of invasive species to prevent their introduction, to detect and control populations of such species, to monitor invasive species populations, and to restore native species and habitats that have been invaded to the extent practical and permitted by law.

At the State level, the New Mexico Noxious Weed Management Act (1998) addresses specific weed concerns and provides a list of prioritize species to be controlled or eradicated. In New Mexico, individual counties are not required by law to develop or maintain lists of noxious weeds, and Grant County does not have a county-specific noxious weed list (Lamb 2003).

The New Mexico Noxious Weed Specialist identified the following species as being high priority in Grant County: dalmatian toadflax *(Linaria genisitifolia* ssp. *dalmatica*), purple loosestrife (*Lythrum salicaria*), yellow starthistle (*Centaurea solstitialis*), African rue (*Peganum harmala*), and Malta starthistle (*Centaurea melitenis*) (Miller 2003). During the 2002 plant survey, no noxious weed species identified on the State noxious weed list were observed (URS 2003; NMDA 2003)

3.2.8 Wildlife

The Little Rock Mine Project Environmental Impact Statement (EIS) (BLM 1997) identified several wildlife species that are known or have the potential to occur in the vicinity of the Tyrone Mine. The proposed Copper Mountain South Pit expansion area is within the study area boundary of the Little Rock Mine EIS, and wildlife species occurring in the expansion site are expected to be similar to those that occur in the surrounding area. Existing wildlife habitats are upland-terrestrial and provide important winter foraging area for mule deer, northern goshawk, and other species. Deadman Canyon provides ephemeral aquatic habitats during spring snowmelt or following episodes of rainy weather.

More than 100 species of birds, 51 species of mammals, and 36 species of reptiles may potentially occur on or near the area surrounding the proposed pit expansion. Species that were commonly observed during surveys include desert cottontail, rock squirrel, coyote, mule deer, Gambel's quail, bridled titmouse, rufous-sided towhee, and the acorn woodpecker (Dames & Moore site reconnaissance, March 1994, January 1995; Metric Corporation 1993, 1996).

Appendix A documents species that are known or have the potential to occur in the vicinity of the project area.

Birds

The avifauna likely to be encountered at the Copper Mountain Mine over the course of a year is diverse and likely to consist of at least 100 species. Metric Corporation (1993) documented the presence of 40 bird species during site reconnaissance of the area over a 2-day period in late August 1993. A subsequent survey identified five additional bird species that are winter residents in the area (Metric 1996).

Included among the species likely to be present are representatives of most native American orders of birds with the probable exception of marine and aquatic species, herons, waterfowl, rails, shorebirds, trogons, and kingfishers. Most of the bird species present are small, insectivorous or granivorous species that glean insects from bark, twigs, and leaves or forage primarily on the ground in search of seeds. Large, predatory species include several species of hawks and owls.

Appendix A is a literature-based inventory of approximately 60 bird species that potentially occur as permanent residents and/or summer breeding species in the general vicinity of the Copper Mountain Mine. Common bird species observed during field surveys include, but are not limited to Gambel's quail, mourning dove, scrub jay, gray-breasted jay, common raven, bridled titmouse, rock wren, rufous-sided towhee and house finch (Dames & Moore 1994; Metric Corporation 1993, 1996).

Raptors

The turkey vulture, Cooper's hawk, red-tailed hawk, and American kestrel raptor species were observed in the vicinity of the project area during field surveys (Metric Corporation 1993). Raptor nests are not known to occur within the project area, although the habitat present may provide foraging areas for raptor species in the vicinity (URS 2003).

Mammals

Based on a review of pertinent regional literature and inventories performed, the probable mammalian fauna of the Little Rock Mine area is presented in Appendix A. Most of the mammals that may be present are small, nocturnal species of rodents and bats that are unlikely to be observed without specific sampling efforts. Larger, often diurnal species include coyote, gray fox, mountain lion, black bear, desert cottontail, black-tailed jackrabbit, and two species of deer. Presence of these species and several others have been documented by Metric Corporation (1993, 1996) and Dames & Moore (site reconnaissance, March 1994, January 1995).

Reptile and Amphibians

The herpetofauna of the Little Rock Mine area likely consists of small species of lizards, small to medium-sized snakes, several toads, and possibly several species of frogs (Appendix A). Metric Corporation (1993, 1996) does not indicate whether any species of reptiles or amphibians were observed during their reconnaissance of the site. The Dames & Moore 1-day reconnaissance in

late March 1994 occurred on a chilly, windy day when one would not expect to encounter any cold-blooded vertebrates. Similarly, the 2-day visit in January of 1995, although clear and sunny, was too cold for most reptiles and amphibians to be active.

Consequently, no documented occurrences of amphibians or reptiles are available. Based on the habitat present, typical species may include desert spiny lizard, tree lizard, Gila spotted whiptail, western whiptail, western blind snake, and western rattlesnake (UNM 2003).

Fish

No fisheries or fish habitat exist within the immediate vicinity of the proposed mine. The drainages that traverse the site are ephemeral and flow only in response to storm events or spring snowmelt.

3.2.9 Special Status Species

Special status species are those species listed by USFWS as endangered, threatened, or proposed and candidates for such listing, BLM sensitive, or species of concern at the State level. Table 3-6 lists the seven special status plant and 11 special status wildlife species identified by the BLM Las Cruces Field Office that have the potential to occur within the habitats in the project area. All species in Table 3-6 are listed as sensitive or special status species with BLM. None of the plants are Federally listed as threatened or endangered. One bird species and one amphibian species are listed as threatened with USFWS.

Table 3-6
SPECIAL STATUS PLANT AND WILDLIFE SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROJECT AREA

Species		Habitat Type[1]	Status[2]			Potential for Occurrence[3]
Common	Scientific		Federal	BLM	New Mexico	
Plants						
Davidson's cliff carrot	*Pteryxia davidsonii*	Cool rocky places in piñon -juniper woodland and lower montane forest, 6,500-8,000 ft.	---	Sensitive (LCFO)	SOC	Moderate
Grama grass cactus	*Toumeya papyracantha*	Open flats in plains grassland, piñon -juniper woodland; in or near fairy rings of blue grama, usually where soil is sandy, 5,000-7,300 ft.	---	Special status	---	Low to moderate
Green-flowered pincushion cactus	*Mammillaria viridiflora*	Gravelly soils of plains and hills in grassland, plains grassland, and piñon-juniper woodland, 4,500–6,500 ft.	---	Sensitive (LCFO)	---	Moderate
Mimbres figwort	*Scrophularia macrantha*	Steep, rocky igneous cliffs and talus slopes; usually north-facing; sometimes in canyon bottoms; piñon-juniper woodland and lower montane forest, 6,500-8,200 ft.	---	Special status	SOC	Low
Porsild's starflower	*Stellaria porsildii*	Shaded and partially open mixed conifer and aspen forests; occasionally on roadsides with steep loamy and rocky embankments, 7,900-8,200 ft.	SOC	---	SOC	Low

Table 3-6
SPECIAL STATUS PLANT AND WILDLIFE SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROJECT AREA

Species		Habitat Type[1]	Status[2]			Potential for Occurrence[3]
Common	Scientific		Federal	BLM	New Mexico	
Slender spiderflower	*Cleome multicaulis*	Wet, saline or alkaline soils; often in and around alkali sinks, alkaline meadows, or old lake beds.	SOC	Special status	SE	No
Wilcox's pincushion cactus	*Mammillaria wrightii* var. *wilcoxii*	Rocky or gravelly slopes and canyons, 3,000-5,000 ft.	---	Sensitive (LCFO)	SE	Low
Wright's catchfly	*Silene wrightii*	Cliffs and rocky outcrops; montane and subalpine, 6,800-8,000 ft.	---	Special status	SOC	Low
Wright's Dogweed	*Adenophyllum wrightii* var. *wrightii*	Swales and drainages in piñon - juniper woodland, sandy or silty soils from 7,000-7,200 ft.	SOC	Sensitive (LCFO)	SOC	Low to no
Wildlife						
Bald eagle	*Haliaeetus leucocephalus*	Prefers timbered areas along coasts, large lakes, and rivers	Threatened	Special status	SE	Low to no
Northern goshawk	*Accipiter gentilis*	Open woodlands, deciduous and coniferous forest edges.	SOC	Special status	SOC	Low to moderate - winter
Fringed myotis	*Myotis thysanodes thysanodes*	Roosts in caves, mines, and buildings; chaparral to ponderosa pine, prefers oak woodland	SOC	Special status	SOC	Low
Long-eared myotis	*Myotis evotis evotis*	Roosts in trees, caves, mines and buildings; common in ponderosa pine woodlands, piñon-juniper woodlands; and subalpine forests. Most common in northern New Mexico mountains.	SOC	Special status	SOC	Low to moderate
Long-legged myotis	*Myotis volans*	Roosts in trees, crevices, and buildings; piñon-juniper, ponderosa pine and coniferous forests.	SOC	Special status	SOC	Moderate
Occult Little Brown Myotis	*Myotis lucifugus occultus*	Roosts in rock crevices, buildings, hollow trees; inhabits ponderosa pine and oak-pine woodland near water.	SOC	Special status	SOC	Low
Western small footed myotis	*Myotis ciliolabrum melanorhinus*	Roosts in rock crevices, buildings, among rocks; most common in coniferous and mixed woodland forests.	SOC	Special status	SOC	Low to moderate
Yuma myotis	*Myotis yumanenesis yumanenesis*	Roosts in rock crevices, buildings, mines, trees; inhabits deserts, grasslands, and woodlands near water.	SOC	Special status	SOC	Low
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*	Roosts in caves, buildings and rock crevices; occupies semidesert shrublands, piñon-juniper woodlands, and open montane forests.	SOC	Special status	SOC	Low
Spotted bat	*Euderma maculatum*	Rocky outcrops of riparian, piñon-juniper, ponderosa pine and spruce pine forests; Mogollon Mountains and Lake Roberts area in Grant County.	SOC	Special status	SE	Low

Table 3-6
SPECIAL STATUS PLANT AND WILDLIFE SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROJECT AREA

Species		Habitat Type[1]	Status[2]			Potential for Occurrence[3]
Common	Scientific		Federal	BLM	New Mexico	
Chiricahua leopard frog	*Rana chiricahuensis*	Aquatic habitats; chaparral, grasslands, desertscrub, oak, mixed oak, and pine woodland; rocky streams with deep rock-bound pools.	Threatened	Special status	SE	No

[1]Source: BLM 1997, Findley 1987, URS 2003, UMN 2003.

[2]From New Mexico Rare Plant Technical Council 1999.

Federal (USFWS): Species of Concern (SOC) - A taxon for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State Wildlife Agencies, other Federal Agencies, or professional/academic scientific societies.
BLM: Special Status – includes Federal proposed, listed and candidate species, as well as state listed species and sensitive species designated by the State Director.
Sensitive (LCFO) – designated as sensitive by the Las Cruces Field Office

State of New Mexico: Endangered (SE) – the taxon is listed as threatened or endangered under the provisions of the Federal Endangered Species Act, or is considered proposed under the tenets of the act; or the taxon is a rare plant across its range within the State, and of such limited distribution and population size that unregulated taking could adversely impact it and jeopardize its survival in New Mexico.

Species of Concern (SOC) – a New Mexico plant species which should be protected from land use impacts when possible because it is a unique and limited component of the regional flora.

[3]Based on habitat description.

NMNHP was contacted to confirm the likelihood of occurrence of all plant species listed in Table 3-6. NMNHP responded by sending an electronic letter and had no records of occurrence for these species in the vicinity of the project area. In addition, no plant species listed in Table 3-6 were observed within the Copper Mountain South Pit Expansion Area during field surveys (Metric Corporation 1993, 1996; URS 2003).

All special-status wildlife species, with the exception of long-legged myotis and pale Townsend's big-eared bat, have been surveyed for, and no individuals were observed (Metric Corporation 1993, 1996). NMNHP was contacted to confirm the likelihood of occurrence of all wildlife species listed in Table 3-6. NMHNP reported records of Northern goshawk occurrence within 3,600 feet of the project area. It is unlikely that Northern goshawk nests in the project area, but the species may use the woodland fringe for winter foraging habitat.

Although NMHNP did not have any records of occurrence for the bat species listed, there is suitable roosting habitat present and a moderate likelihood of occurrence for long-legged myotis and western small-footed myotis. Roosting habitat is present for long-eared myotis, but this species is most commonly found in the northern mountains of New Mexico, and it is unlikely to be found in the project area (Findley 1987).

Occult little brown bat, Yuma myotis, and spotted bat occur primarily near water bodies that provide insect foraging opportunities. No water bodies are present in the immediate vicinity of the project area, and it is unlikely that these species occur. No roosting habitat exists for fringed myotis or pale Townsend's big-eared bat within the project area, but these species may use the area for foraging.

Bald eagle and Chiricahua leopard frog, Federally threatened species, are unlikely to occur due to lack of a permanent water supply in the vicinity of the project area. Fish are the primary food

source for bald eagles, and they nest in the tops of large trees near rivers, lakes, marshes, or other wetland areas. In winter, northern birds migrate south and gather near open water areas (Wassink 1991). Chiricahua leopard frogs exist from 3,000 to 7,800 feet in habitats where adequate water depth provides escapes from predators. Habitat tends to contain abundant aquatic vegetation. This species needs permanent water for reproduction (Degenhardt et al. 1996; Stebbins 1985).

3.2.10 Cultural and Paleontological Resources

Cultural resources are defined as the physical remains of Native American or Euro-American habitation or use. Cultural resources could also be other aspects of the natural landscape that were important to the Native American residents.

Paleontological resources are fossil remains of extinct flora and fauna. Paleontological resources are found mainly in sedimentary deposits. Due to the nature of the geological deposits in the project area (predominately igneous), finding significant fossil remains would be highly unlikely.

In March 2002, Human Systems Research, Inc. (HSRI) performed a cultural resources survey of the proposed Copper Mountain Mine Expansion. Their report (Kirkpatrick 2002) contains information on the prehistoric and historic nature of the project area. The following discussion is taken from that report.

The archaeological survey recorded one historic site and no prehistoric sites. The historic site (LA 135,556) consists of a concrete tank, a concrete retaining wall, and remnants of unimproved roads. Since the site is less than 50 years old, it is not eligible for the National Register of Historic Places (NRHP), and a determination of no effect has been recommended. The survey also recorded five isolated occurrences, consisting of a horseshoe and several prospect pits. This site is located on private land, and the isolated occurrences are on BLM lands.

The HSRI survey did not record any archaeological sites associated with Native American occupation or use of the project area. This may be due to the rugged nature of the landscape and the later historic mining disturbance. The HSRI report (Kirkpatrick 2002) presents a brief regional cultural history, including both the prehistory and history.

HSRI conducted a records search at the Museum of New Mexico and BLM for previously recorded sites in the eight sections surrounding the project area. Three sites were identified; two historic mining camps and a prehistoric artifact scatter. The mining camps include Paschul, established in 1880 and abandoned in 1883, and Leopold, established in 1902. In 1909, Phelps Dodge bought many of the mining properties in the region, including Leopold, and mining and smelting functions were transferred to Tyrone. The artifact scatter consists of stone tools and tool manufacturing debris. There were no culturally or temporally diagnostic artifacts recorded, so the site affiliation is unknown. These three sites are outside the project area.

Site LA 135,556 is a historic mining site in the vicinity of Liberty Bell Mine, consisting of a two-piece retaining wall and an open concrete tank. The Liberty Bell Mine appears to have been removed with the later mining activity. The retaining wall is located on the terrace just above the arroyo that drains to the north. The concrete tank is upslope from the retaining wall. Vegetation includes ponderosa pine, oak, piñon pine, and a variety of shrubs.

The retaining wall is formed by two walls of poured concrete. The north wall, which is oriented east-west, is 69 feet long. Wall height is 20 inches at the east end and 92 inches high at the joint

with the west wall. The west wall, oriented north-south, is 55 feet long and 51 inches high at the south end and 75 inches high at the joint with the north wall. The interior walls have small patches of tar or a similar black substance. This suggests the interior walls were probably painted with a tar-like substance to protect the concrete.

A concrete floor is present, extending from the south end of the west wall across to the east end of the north wall. This triangular floor appears to have at least one joint, evidenced by several shrubs growing in a linear pattern. The thickness of the floor is not known.

While the exact function of the feature is not known, it is suggested that the walls were part of a retaining system for liquids, or part of a small heap leach operation. This is inferred by the presence of the tar lining on the walls and two drain holes in the north wall. The main problem is the lack of the third wall to make an enclosed tank. It appears the walls were built into the hillsides. At this time, the north wall goes into the hillside, but this is not the case with the west wall. The south end of the west wall is freestanding. Any liquid would flow around the end of the wall. It is possible that there was originally a structural feature or dirt fill that served as a retaining wall between the concrete wall and the hill slope.

A large concrete tank is located to the south and upslope of the hill. The tank measures 24 feet long, 68 inches wide, and 96 inches high. The interior of this tank shows evidence of a black lining, possibly tar or asphalt. A smaller tank is located on the exterior of the west wall. The north and south walls abut the west wall of the larger tank. The tank is 84 inches long and 80 inches wide. It is 54 inches from the ground surface. Both tanks are covered with a 0.25-inch-thick concrete plaster.

A bladed road is present in front of the tank, and to the west is a spoils pile. Near the top are two short lengths of what appears to be narrow gauge track. These may be from earlier activities at Liberty Bell Mine.

Site LA 135,556, located on private land, is a historic site associated with mining activities, probably using leach processes that began in the early 1960s. The artifact assemblage associated with the site is very limited. With the exception of segments of polyvinyl chloride (PVC) pipe, there are no diagnostic artifacts. Glass bottles, metal cans, and similar litter are noticeably absent. Since the site is less than 50 years old, the site is recommended as not eligible to the NRHP.

3.2.11 Visual Resources

Visual characteristics of the site are described using the BLM Visual Resource Management System (BLM 1986a; 1986b), developed by BLM to manage the visual, or scenic, resources of lands under its jurisdiction. This system involves the assessment of an area's scenic quality, sensitivity to visual change, and distance zones based on visibility of an area from observation points. These three factors are evaluated and combined to determine Visual Resource Management (VRM) classes. These classes and management objectives for each class are described in Table 3-7.

Table 3-7
VISUAL RESOURCE MANAGEMENT SYSTEM

Class	Objective
Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activities that would result in very limited change to the landscape and must not attract attention.
Class II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low and not attract the attention of the casual observer.
Class III	The objective of this class is to partially retain the existing characteristic landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but not dominate the view of the casual observer.
Class IV	The objective of this class is to provide for management activities that require major modification to the existing character of the landscape. The level of change to the characteristic landscape can be high and dominate the view to an observer. Impacts should be minimized through careful location, minimal disturbance and repetition of the basic landscape elements found in the characteristic landscape.
Rehabilitation Areas	This classification is applied to areas were the characteristic landscape has been substantially disturbed and needs rehabilitation to conform to an appropriate VRM class objective.

Source: BLM 1986a

All BLM land involved in the proposed project has been mapped as VRM Class IV. As described in the above table, this management class allows for activities that may result in major change to the character of the landscape, although it does require consideration of methods for minimizing visual impact.

Private lands in the project area are not mapped by BLM for VRM classes, nor does BLM have jurisdiction or management responsibilities for the visual condition of private lands. However, for purposes of this assessment, all lands in the project area have been described using the VRM system. Private lands adjacent to BLM land have similar visual characteristics, except for the highly disturbed mining areas, which would be considered rehabilitation areas.

The proposed project is located in the southwest corner of New Mexico, within the Mexican Highland section of the Basin and Range physiographic province (Fenneman 1931). This is a region characterized by isolated ranges separated by aggraded desert plains. The site is located on the southern edge of the Mangas Valley, on the northeast flank of the Big Burro Mountains. This is a foothill landscape with varied elevations ranging from approximately 6,100 to 6,400 feet.

Landcover is primarily a mosaic of exposed rock, mixed woodland with junipers, piñon pine, ponderosa pine, and various shrubs, and disturbed areas with successional species such as snakeroot and lupine. The scenic quality of the surrounding landscape is common for the region. A historic leach stockpile is located on the site and has a negative influence on the visual quality of the expansion area, with large exposed areas and eroded side slopes.

The pit expansion is adjacent to, and continuous with, the Copper Mountain Pit, part of the existing Tyrone Mine complex. The visual character of the proposed expansion area is

influenced by the existing disturbance, which is a highly industrialized area. The existing mine includes large areas of exposed rock, haul roads, and leaching and processing facilities, which has created strong visual contrasts with the surrounding native landscape. The area would be classified as a rehabilitation area for visual resources.

Visual sensitivity of an area is a function of many factors, including types of users that typically can view the area; the number of people who can see the site; the presence or absence of adjacent land uses that may be sensitive to changes in the existing visual condition, including special areas such as wilderness or scenic areas; and distance between potential viewers and the site. The proposed pit expansion area is located in a relatively isolated area adjacent to a large existing mining operation. A large percentage of viewers who would typically see the site are involved in mining activities.

The Mangas Valley Road is located approximately 3 miles northeast of the expansion area; the road is primarily used as an access to the Tyrone Mine. Forest Road 136 is located approximately 0.5 miles south and has intermittent views of the existing mine and expansion area. Some of the users of this road are recreational users accessing the National Forest, including the CDNST, and are considered to be viewers sensitive to changes in scenic quality. Residential land use in the area includes one ranch residence located approximately 1.5 miles southwest of the expansion area and another ranch residence located approximately 2.2 miles to the northeast. Intervening terrain and vegetation screen views from these locations towards the pit expansion area.

3.2.12 Socioeconomics

Population Characteristics

The project is located in Grant County, New Mexico, approximately 10 miles south of Silver City, which is the county seat. Table 3-8 displays a summary of population trends in Grant County from 1970 to 2000.

Table 3-8
GRANT COUNTY POPULATION TRENDS, 1970 - 2000

	1990 - 2000			1980 - 1990		1970 - 1980	
	2000 Census	1990 Census	% Change 1990-2000	1980 Census	% Change 1980-1990	1970 Census	% Change 1970-1980
Grant County	31,002	27,676	12.0	26,204	5.6	22,030	18.9
Silver City	10,545	10,984	(1.3)	9,887	11.1	8,557	15.5

Source: State of New Mexico, Economic Development Department

As shown in Table 3-8, Grant County has experienced continuous growth since the 1970s, although Silver City had a small decline in population in the 1990s. The majority of Grant County's population lives within a 10-mile radius of Silver City, including the towns of Bayard, Santa Clara, and Hurley.

The 2000 U.S. Census indicates that the population in the county has an equal distribution of male and female, and also of Hispanic or Latino race and those classified as white. Of the

population over the age of 25, 79.4 percent have a high school degree or higher, and 20.5 percent have a bachelor's degree or higher.

Employment and Income

According to the New Mexico Department of Labor, Grant County had a civilian labor force of 12,615 in 2000. Of the available labor force, 11,853 were employed, 762 were unemployed, for an unemployment rate of 6.0 percent. As of March 2003, the civilian labor force was 13,136, total employed was 11,423, and the unemployment rate was 13.0 percent. The 2003 unemployment rate is more than twice the rate in 2000, reflective of several factors, but primarily the result of layoffs in the mining industry. Poverty status in 1999 included 5,676 individuals, or approximately 18.7 percent of the population in the county (U.S. Census 2000).

The industries employing the largest number of workers in Grant County, starting with the largest employers, include State and local governments, mining, accommodations and food service, and retail trade. Phelps Dodge is the single largest private employer in Grant County, with 1,391 total employees in 2001 of which, 768 were employed at the Chino Mine, 9 were employed at the Cobre Mine, 600 employed at the Tyrone Mine, and 14 employed at the Hidalgo Smelter. In 2002, Phelps Dodge employed 397 employees at the Tyrone Mine, which is a 66% percent decrease in employment within one year (Phelps Dodge).

Table 3-9 displays economic indicators for Grant County for 1990, 1995, and 2000. As shown in the table, personal per capita income has increased from $12,457 in 1990 to $18,507 in 2000, representing a 48.6 percent increase. Gross receipts from retail trade also had a significant increase, increasing 67 percent the same time period. Other indicators in the table are also showing an increase from 1990 to 2000.

Table 3-9
ECONOMIC INDICATORS FOR GRANT COUNTY

Year	Per Capita Personal Income	Annual Average Wage/Salary per Job	Number of Business Establishments	Gross Receipts from Retail Trade
2000	$18,507	$22,712	680	$204.7 million
1995	$16,388	$22,285	638	$174.2 million
1990	$12,457	$18,931	605	$122.5 million

Source: New Mexico Economic Development Department

Housing

The 2000 Census reports 14,066 total housing units in Grant County, of which 12,146 were occupied. Of the occupied units, 9,041 were owner occupied and 3,105 were renter occupied. The area had an average homeowner vacancy rate of 2.5 percent and an average rental vacancy rate of 13.3 percent. Median home value in the Silver City/Grant County area for a 3-bedroom house was approximately $123,000 in January 2003 (Silver City - Grant County Economic Development Corporation).

Public Services and Finances

Silver City

Silver City operates under a mayor, city manager, and city council form of government and provides public services including fire and police protection, street and roads, community centers, health and welfare, and recreation facilities. The Texas - NM Power Company provides electric power, and PNM Gas Service supplies natural gas utilities. Qwest is the local telephone service provider. The town of Silver City provides water and sewer service.

In fiscal year (FY) 2002, the town of Silver City had total revenues of $9,772,188 of which $8,521,154 came from general fund types, $517,058 from special revenue, $116,951 from debt service, and $617,025 from capital projects. Expenditures totaled $ 10,062,013, of which $7,992,218 was from general expenditures, $616,851 was from special revenue, 603,143 was from debt service, and 849,801 was from capital project expenditure. (Town of Silver City 2002)

Grant County

Grant County offices are located in the Grant County Courthouse in Silver City. The county operates with a county manager and a county board of commissioners. The county had $16,883,530 in total revenues in FY 2001-2002, of which property taxes contributed $5,095,554 (Grant County 2003).

Property tax revenues included proceeds from the Copper Production Ad Valorem Tax (AVT), which is collected from copper producers and then distributed to the county and State governments, school districts, and special districts. In FY 2001-2002, the Copper Production AVT in Grant County yielded $1,653,321 million to local (non-State) jurisdictions. The county government's share was $761,650, of which was all allocated to government operations and to dept repayment. The Silver City District received $167,060 and the Cobre District received $724,610 (Grant County 2003).

Of total expenditures in FY 2001-2002 of $15,492,908, $11,333,968 went to general government activities, including administration, public safety, highway and streets, and health and welfare (Grant County 2003).

Grant County has two school districts (Silver City and Cobre districts) with a total enrollment in grades pre-kindergarten through 12 of approximately 5,075 in the 2002-2003 school year (NM Department of Education; Data Collection and Reporting Unit).

4.1 ENVIRONMENTAL IMPACTS

4.1.1 Lands and Access

Proposed Action

Mining within the proposed pit expansion area would not conflict with either BLM or Grant County policies for land management. The site is within an area described in the BLM Mimbres RMP as open to mineral development and is adjacent to land already dedicated to mining activities. Continued mining at Copper Mountain would meet the Grant County objectives for economic development within the county, and Federal and State requirements for reclamation would help minimize negative environmental impacts of the project.

The project would impact approximately 13.9 acres of public land that would be occupied by PDTI for the life of the project, which is estimated to take up to four years. During this time the public land would have restricted access due primarily to public safety concerns. Fencing around hazardous conditions at the site would be a long-term condition on public land at the site.

Existing land use in the vicinity of the expansion area includes two residences, one approximately 1.5 miles to the southwest and one approximately 2.2 miles to the northeast. The project would not affect access to any of these residences, nor would the project affect the use or value of those residences. Post-mining land use for the site is wildlife habitat. Successful reclamation would result in conditions that could benefit a wide range of wildlife, including deer, small mammals, and birds.

The major recreational amenity in the area is the CDNST, located approximately 0.5 to 1 mile south of the expansion area. The trail is accessed from Forest Road 136, which would not be affected by the proposed project. There are locations along the trail where the Copper Mountain Mine and expansion area could be seen. Burro Peak is a common destination for hikers on the trail and views from that location would include the mine and parts of the expansion area. Distance between Burro Peak and the expansion area (approximately 3 miles) and the existing disturbance of the adjacent Tyrone Mine complex would make the pit expansion area a minor factor in the overall aesthetics of the area for trail users.

Access into the expansion area would be through the existing Copper Mountain Mine. No impacts to the transportation system are anticipated.

No Action Alternative

No mining would potentially not meet the guidelines outlined in the Mimbres RMP for mineral development, unless unnecessary or undue degradation of the land is identified. A final decision on the adequacy of the proposed action to prevent unnecessary or undue degradation will be made in the Decision Record. The No Action Alternative would not meet the Grant County objective contained in the Grant County Comprehensive Plan for economic development.

No action would result in no change to the existing use of the land or surrounding land uses and would not change the potential future uses on the land.

4.1.2 Geology and Minerals

Proposed Action

The proposed action would result in the removal of approximately 36 million tons of copper ore and 27 million tons of waste rock. It is estimated that the copper ore would produce approximately 72 million pounds of recoverable copper. Mining and removal of the ore and waste rock, and processing of the recoverable copper would remove this mineral resource from existing reserves.

No Action Alternative

Under the No Action Alternative, the mineral resource would not be mined, 72 million pounds of recoverable copper would not be produced, and the ore would remain in place potentially available for future mining.

4.1.3 Soils

Proposed Action

The project area consists of near equal amounts of interspersed barren exposed rock and shallow soil. Little topsoil exists in the project area, and it is not anticipated that topsoil would be of sufficient quantity to be salvaged. However, should salvageable amounts of topsoil be encountered, it would be stockpiled for use in reclamation. Most soil would be processed with waste rock material and be used to partially backfill the San Salvador Pit located at the Tyrone Mine.

The Santa Fe-Rock outcrop soil covers the majority of the project area and has high wind and/or water erosion hazard potential. As a result, soil erosion rates may increase as result of disturbance throughout the life of the project. However, water flows would be directed into the pit area, and Deadman Canyon should not be affected. Some impacts would be mitigated by implementation of the Reclamation Plan for the Copper Mountain South Pit Expansion Project.

Long-term soil productivity would be reduced for the project area since soils in the proposed pit would be removed and soils would be disturbed and compacted along the haul road. Sediment control along the haul road would greatly reduce the potential for increased gully and rill erosion in the cut and fill material. Per the Reclamation Plan for the Copper Mountain South Pit Expansion Project, reclamation of the haul road would involve ripping the haul road top surface to a depth of no less than 2 feet, and revegetating the surface in a manner consistent with the Tyrone Mine Closure/Closeout Plan. Remaining site access roads would have drainage ditches and berms constructed to minimize stormwater erosion of road surfaces. The reclamation plan also includes covering and revegetating approximately 9 acres of the mined area (see Map 6). These areas include the pit bottom and flat bench areas that will be covered with topsoil and/or growth medium, and seeded. These areas will contribute to restoring soil productivity in portions of the project area.

No Action Alternative

Under the No Action Alternative, there would be no changes to soils from the existing condition. In previously disturbed areas, soil could be subject to accelerated erosion. In undisturbed areas, natural erosion rates will continue.

4.1.4 Water Resources

Proposed Action

The effects of the proposed project on surface water, surface drainages, and groundwater are discussed in this section. The proposed pit expansion would include the following actions, which may affect water resources:

- Removal of the remaining historic leach stockpile in the Copper Mountain pit expansion area.
- Re-direction of some of the Deadman Canyon watershed runoff to the pit excavation.
- Exposure of new rock faces to air and precipitation.
- Development of a haul road.

Since extracted ore would be processed at existing Tyrone leach stockpiles, and barren waste rock would be stored on existing Tyrone waste rock piles or reclamation areas, the Copper Mountain South Pit Expansion ore management would not affect water resources in the pit expansion area.

PD has not performed quantitative geochemical characterization on the historic leach stockpile, however, the stockpile was operated by U.S. Natural Resources Inc. as a leach stockpile in which sulfuric acid leaching took place in the early 1970's to recover copper at a "precipitation plant" formally located near the stockpile. The stockpile contains stored acid that can be mobilized by meteoric water. The release of the stored acid has the potential to degrade groundwater quality, and it is assumed that water quality has been impacted to some degree by this material over time.

Groundwater flow directions would not be significantly affected by the pit expansion since pit construction is above the regional groundwater elevation of approximately 6,000 feet, and no stream diversions would occur due to the pit expansion.

Surface Water

None of the mining activities proposed would directly affect Deadman Canyon. The effect of pit construction would be to divert stormflow from a small surface watershed from Deadman Canyon to the Copper Mountain Pit. Some of this stormflow is already diverted to the Tyrone Mine water control system. Based on measurements of the drainage basin by PDTI engineers, it has been conservatively estimated that 1 to 2 acre-feet/year would no longer flow into Deadman Canyon. This is equivalent to less than 1 gallon per minute. The reduced Deadman Canyon Watershed area would result in slightly lower flood flows and total runoff than for existing conditions.

PDTI has incorporated design measures to mitigate erosion and potential flood effects by leaving a buffer between the pit and Deadman Canyon to prevent the potential for floodwater to

overflow into the pit. Best Management Practices (BMPs) outlined in the mine's Stormwater Pollution Prevention Plan (SWPPP) would be employed to minimize erosion and discharge of suspended solids to Deadman Canyon. Map 5 shows a cross section through the Deadman Canyon/Pit Expansion area. Since the final elevation of the pit would be substantially below the bottom of Deadman Canyon, any water collecting in the pit would not flow into Deadman Canyon.

No discharge of any process wastewater to any surface water course is planned to be part of the mining operations. No stream diversions would occur due to the proposed pit expansion.

The proposed haul road would be constructed through the existing Copper Mountain Pit and into the pit expansion area. It would not impact Deadman Canyon. Any water drainage and sedimentation due to road construction or changes to surface water flow patterns would be directed into, and contained by, the pit.

Groundwater

The principal hydraulic gradient in the project area is toward the Main Tyrone Pit. Excavation of the Copper Mountain South Pit Expansion is not anticipated to change the regional flow pattern since the lowest point in the Copper Mountain Pit would be in the currently existing pit, not in the expansion area. Drainage in the expansion area would be toward the main Copper Mountain Pit.

A groundwater (FLOWPATH) model was used in the Little Rock Mine EIS (BLM 1997) to assess steady-state and transient groundwater flow conditions. This model covered the area of the Tyrone Main Pit and the Copper Mountain Pit. The model was calibrated to match pre-mining and 1995 groundwater conditions. Model boundary conditions (groundwater elevations) were based on regional groundwater elevation contour maps, and hydraulic properties were assigned based on regional data and site-specific measurements for Precambrian rocks, alluvium, and pit backfill. Dewatering at the Tyrone Main Pit was simulated. The bedrock units were assumed to be significantly fractured and to act as a porous medium.

A smaller (MODFLOW) model was used to simulate the effects of dewatering of the Copper Mountain Pit Expansion. This model used the conditions calibrated in the model for the Little Rock Mine (BLM 1997) as described above. Mine dewatering was assumed to require that 10 percent of the expanded pit base would be dewatered to 200 feet below groundwater elevations for 1 year. These conditions were represented by fixed heads in the base of the pit. Model calculations showed that:

(1) Insignificant changes to the regional flow pattern would result, and

(2) A small drop in regional groundwater levels would occur.

Based on the predicted drawdowns resulting from dewatering and the locations of residential wells within the 1997 EIS study area, no well drawdowns are expected to result from this project. Groundwater data collected since 1997 at the monitor wells in the project area have indicated that groundwater quality has generally improved or stayed the same, and that there has generally been no change in groundwater flow direction (PDTI 2005b). There are several seeps within the predicted zone of influence of pit dewatering. However, it is likely that these seeps are disconnected from the regional groundwater flow system and would be unaffected by dewatering.

SEE MAP 5

Expanding the Copper Mountain Pit and mining of the remaining historic leach stockpile will remove a potential source of water contamination and is expected to have a positive effect on shallow water quality in the area.

Acid Rock Drainage

Metal sulfides, when exposed to air and water, can become oxidized and produce acidic water. The rock in the Copper Mountain South Pit Expansion area primarily consists of non-acid-generating copper oxides. Based on the rock characteristics, as described in Section 3.2.2, there is not a potential for acid generation either from waste rock or from the pit wall during or after mining. Therefore, no acid rock drainage impacts are expected to result from the project. PDTI has committed to an annual review of acid-producing material in the pit walls and will prepare assessment/alternative plans to address the issue if necessary.

No Action Alternative

The No Action Alternative would result in no mining in the pit expansion area. There would be no change to the existing condition of the Deadman Canyon Watershed. The historic leach stockpile currently located on the site would not be removed, and any improvement in water quality that would be the result of removing the stockpile would not occur.

4.1.5 Air

Proposed Action

The primary air quality issue for the pit expansion project is airborne particulate matter. The potential for gaseous pollutant emissions is negligible for a project of this type. Activities associated with the proposed action that may cause an increase in particulate matter include site clearing and preparation, blasting, loading of material, transport of ore and waste rock in haul trucks, and dumping of material.

In general, open pit mines do not experience significant mixing of ambient air below the pit rim with airflow above the rim. Activities within the pit expansion area, except for the initial land clearing, would occur below the pit rim and airborne particulate matter generated within the pit expansion, or in the main Copper Mountain Pit where material would be transported through on the proposed haul road, would have minor off-site impacts.

No Action Alternative

Under the No Action Alternative, mining would not take place in the pit expansion area, and the potential for generation of airborne particulate matter due to project activities would not occur.

4.1.6 Noise

Proposed Action

Noise level criteria used for impact analysis are typically based on recommendations from EPA (1974) and on standard engineering practices. EPA has determined that L_{eq} greater than 70 dBA

to be a risk to public health and welfare, and L_{dn} greater than 55 dBA to be an annoyance to humans. These values are typically used to assess the noise impact from earth-moving equipment.

The U.S. Bureau of Mines (1980) developed annoyance and damage criteria for noise levels produced from blasting. The Bureau of Mines has determined that peak linear decibel levels (dBL) should not exceed 129 to minimize annoyance, and should not exceed 134 dBL to minimize the possibility of structural damage.

The noise impact assessment for the Little Rock Mine EIS included a study area that encompassed the Copper Mountain South Pit Expansion area. The results of the assessment would be considered to be generally applicable to the proposed project due to the proximity of the Little Rock Mine to the Copper Mountain South Pit, and the similar nature of noise generating activities at the mine for both locations. However, the Little Rock Mine EIS included the analysis of haul road alternatives that were outside the pit boundaries, which had the potential to generate construction and operation noise greater than what would be expected at the Copper Mountain South Pit Expansion, since the haul road for the pit expansion would be located within the pit expansion area and the existing Tyrone Mine.

All applicable noise levels for earth-moving and blasting activities were below EPA and Bureau of Mines respective criteria in the Little Rock Mine analysis. It is expected that noise levels for the proposed project would be lower than for the Little Rock Mine since receptors at the Little Rock Mine site were considerably closer (3,000 feet to closest residence) than for the Copper Mountain South Pit Expansion (7,900 feet to closest residence).

Over large distances, such as those between the receptors and the pit, air blast propagation is strongly dependent on wind, temperature, and terrain conditions. Under ideal propagating conditions (i.e., a receptor located downwind from the blast during a temperature inversion), air blasts could be audible at any of the identified residences. Blasting will be limited to daytime hours which will reduce potential effects to receptors.

No Action Alternative

Under the No Action Alternative, noise generating activities such as blasting and earth-moving would not occur, thus eliminating the potential for noise impacts.

4.1.7 Vegetation

Proposed Action

The proposed pit expansion would cover an estimated 31.1 acres. Of this acreage, approximately 4.2 acres of disturbed/successional community, 8.2 acres of mixed woodland community, and 18.7 acres of disturbed/mixed woodland mosaic community would be removed. The vegetation within the project area consists of piñon-juniper and ponderosa pine woodlands interspersed with disturbed areas dominated by a mix of shrubs, forbs, and grasses. Riparian vegetation does not exist within the project area. The loss of such habitat in the vicinity of the mine would have minimal impact on the integrity of the surrounding area.

Various mining activities have the potential to introduce noxious weeds into the project area. These activities include, but are not limited to, mobilization of mining vehicles, land clearing, and reclamation. Removal of existing vegetation and disturbance of soils may encourage germination of seeds and allows spread of weed from airborne seeds. After mining is complete, noxious weeds can persist or become established on road edges and in reclaimed areas.

No noxious weed species were observed in the project area during the 2002 survey. Disturbance of the area would increase the likelihood that noxious weed species would become introduced. Controls outlined in Section 4.3 will be implemented to limit introduction and spread of noxious weed species.

As described in the Reclamation Plan of the MPO/CCP, the haul road and disturbed areas surrounding the pit would be revegetated. Table 4-1 lists the seed mixture developed for the Copper Mountain South Pit Expansion Project. Revegetation of the highwalls is not proposed. Over time, spalling of these features would create broad areas of unconsolidated material that is expected to be naturally revegetated by native species. Map 6 shows areas of reclamation for the pit expansion area.

Table 4-1
RECLAMATION SEED MIX AND RATES

Species[1]	Life-Form	Duration[2]	Seasonality	Rate[1,3]
Primary				
Blue grama (*Bouteloua gracilis*)	Grass	Per	Warm	0.25
Side-oats grama (*Bouteloua curtipendula*)	Grass	Per	Warm	1.25
Black grama (*Bouteloua eriopoda*)	Grass	Per	Warm	0.10
Green sprangletop (*Leptochloa dubia*)	Grass	Per	Warm	0.15
Plains lovegrass (*Eragrostis intermedia*)	Grass	Per	Intermediate	0.05
Bottlebrush squirreltail (*Elymus elymoides ssp elymoides*)	Grass	Per	Cool	1.25
New Mexico needlegrass (*Heterostipa neomexicana*)	Grass	Per	Cool	1.75
Streambank wheatgrass (*Agropyron dastachyum* v. *riparium*)	Grass	Per	Cool	1.50
Apache plume (*Fallugia pardoxa*)	Shrub	Per	NA	0.10
Mountain mahogany (*Cercocarpus montanus*)	Shrub	Per	NA	1.00
Winterfat (*Krascheninnikovia lanata*)	Shrub	Per	NA	0.60
Prairie clover (Dalea candidum)	Forb	Per	NA	0.15
Globe mallow (*Sphaeralcea* sp.)	Forb	Per	NA	0.10
Blue flax (*Linum lewisii*)	Forb	Per	NA	0.15
Total PLS (lb/ac)				**8.40**
Alternate Species				
Needle-and-thread (*Heterstipastipa comata*)	Grass	Per	Cool	ND
Thickspike wheatgrass (*Agropyron dastachyum*)	Grass	Per	Cool	ND
Sand dropseed (*Sporobolus cryptandrus*)	Grass	Per	Intermediate	ND
Tobosa (*Pleuraphis mutica*)	Grass	Per	Warm	ND
Bush muhly (*Muhlenbergia porteri*)	Grass	Per	Warm	ND
Skunkbush sumac (*Rhus trilobata*)	Shrub	Per	NA	ND
Rubber rabbitbush (*Ericameria nauseosa*)	Shrub	Per	NA	ND
Prairie coneflower (*Ratibida columnifera*)	Forb	Per	NA	ND

[1]Seed mix and rates are subject to change based on future investigations
[2]Per = Perennial
[3]Rate is in pounds of pure live seed (PLS) per acre (lb/ac); substitutions may change seeding rates
NA = Not applicable
ND = Not determined
PLS = Pure live seed

SEE MAP 6

No Action Alternative

Under the No Action Alternative, the proposed pit expansion area would remain in its present state. There would be no additional loss of vegetation as a result of this alternative.

4.1.8 Wildlife

Proposed Action

Wildlife in the vicinity of the project includes big game species, small mammals, diverse avifauna on a seasonal and residential basis, and reptiles. The proposed action alternative would result in the loss of 31.1 acres of wildlife habitat. Big game and avian species would likely avoid the area during operations. There would be a loss of ground dwelling mammals and reptiles during the life of the project as a result of blasting and topsoil removal. Increased vehicle traffic in the area may result in the direct mortality of wildlife due to collisions with haul vehicles.

Wildlife avoidance of the area would be a short-term effect occurring during the life of the mining activity at Copper Mountain. It is not anticipated that the displacement of big game into adjacent habitat would be detrimental to the populations due to the existence of higher quality habitat west and south of the Tyrone Mine and the relatively small size of the affected area. No critical seasonal habitats or birthing areas for big game are known to occur in the vicinity of the project area; therefore, effects from mining activity would not have long-term adverse effects on population dynamics or recruitment numbers. Approximately 9 acres within the project area will be revegetated during reclamation and will provide a post-mining wildlife habitat land use.

No raptor nests are known to occur in the project area. The project area may provide foraging habitat for raptor species. Loss of this habitat is not likely to have adverse effects on raptor populations due to higher quality habitat being available west and south of the Tyrone Mine.

No fisheries or fish habitat exist in the vicinity of the project area; therefore, impacts to water quality would not be an issue for fish populations.

No Action Alternative

Under the No Action Alternative, there would be no additional loss of wildlife habitat.

4.1.9 Special Status Species

Proposed Action

No significant unavoidable adverse effects would occur to special status species as a result of the proposed action. Several special status species have the potential to occur in the vicinity of the Tyrone Mine, although known locations of such species do not exist on the Copper Mountain South Pit Expansion site.

The green-flowered pincushion, a BLM sensitive species, is known to occur on the Tyrone Mine, but was not found during a survey of the project area in 2002, and no impacts to this species are expected. The BLM authorized officer (special status plants specialist) will be informed of the

discovery of any special status plants in the mine area. The special status plants specialist will coordinate any mitigation, such as transplanting, that is undertaken.

Northern goshawks nest in contiguous mature woodlands and have the potential to occur in the project area. No raptor nests are known to occur within the expansion site. Approximately 8.2 acres of contiguous woodland constituting 26.4 percent of the project area would be lost, and it is unlikely that the loss of this habitat would have an adverse effect on the population.

Only two of the eight special status bat species have a moderate potential to occur on the proposed expansion site. These species inhabit ponderosa pine, piñon-juniper, or mixed woodlands. Approximately 26.9 acres of these woodland communities, of which 8.2 acres are contiguous, would be lost as a result of the project. The habitat present is generally low quality with few large diameter trees that could be used for roosting and it is unlikely that mining activities would have an adverse affect on bat populations. During the winter months, bats species will generally roost and hibernate at warmer, lower elevations and are unlikely to be in the project area.

Four known historic mine openings are in or adjacent to the project area. None of the openings are within area of proposed disturbance. Should any unexpected mine openings be discovered during mining, PDTI will conduct a bat survey before closing any openings. If bats are found, PDTI would consult with NMGF on recommended closure procedures.

No suitable habitat exists in project area for bald eagle and Chiricahua leopard frog due to the lack of permanent water sources. The loss of the habitat present within the project area would not adversely affect the populations of these species.

No Action Alternative

The No Action Alternative would not result in the loss of potential habitat for special status species that may occur in the vicinity of the project area.

4.1.10 Cultural and Paleontological Resources

Proposed Action

One site, LA 135,556, located on private land, may be partially impacted by the Copper Mountain South Pit Expansion. This site has been recommended as not eligible for the NRHP. The isolated occurrences, a horseshoe and prospect pits, are located outside the area of disturbance. Therefore, this action would not impact any significant cultural resources. Native American groups listed in Table 5-1 have not responded to BLM's letters requesting information or concerns. Since the geologic formations in the project area are principally igneous, there is little likelihood of impact to any paleontological resources.

No Action Alternative

Under the No Action Alternative, there would be no impact to any cultural resources.

4.1.11 Visual Resources

Proposed Action

The extent to which the proposed project would affect visual quality depends on the amount of visual contrast created between the proposed facilities and the existing landscape features. The relative value of the visual environment is defined by the VRM classification of the site, which as described in Section 3.2.11, is a function of scenic quality and sensitivity to visual change. Impacts would occur if the project impacts scenic resources having rare or unique value; would impact views from, or the visual setting of, designated or planned parks, recreation areas, residential areas or other sensitive land use; or would exceed the level of disturbance compatible with the VRM classification.

The project is located on VRM Class IV lands where landscape modifications may dominate the landscape and be a focus of viewer attention. Constructing an open pit mine on the site would create major visual contrasts, including changes in topography, clearing of vegetation, and creation of large exposed areas of subsoil and rock. This would produce strong visual contrasts with the natural landscape.

The open pit wall and benches would create strong linear contrasts, and the color of the exposed rock would also contrast with adjacent vegetated areas. However, the expansion area is bounded on two sides by the existing Copper Mountain Pit, which has created a highly industrialized environment. The site itself has been impacted by past mining operations including exploration roads and a leach stockpile. The landscape also has natural areas of exposed rock of the same general color of the rock exposed by mining. All of these factors combine to reduce the overall contrast between the existing condition and the proposed project.

The expansion area is approximately 31.1 acres and is located next to the Tyrone Mine complex, which has visually impacted more than 7,700 acres. The incremental impact of the pit expansion is minor in scale, and the overall visual change caused by the proposed action would be negligible from any of the identified sensitive viewpoints, including views from the CDNST.

No Action Alternative

Under the No Action Alternative, mining would not occur in the pit expansion area. The visual impact of open pit mining, including the visual contrasts caused by changes in landform and large areas of exposed rock would not occur.

4.1.12 Socioeconomics

General Phelps Dodge Effects to the Local Economy

Phelps Dodge employed 650 workers in Grant County in 2002, including approximately 397 workers at the Tyrone Branch. The total direct value of payroll, payroll benefits, and local taxes paid to Grant County residences, businesses, and government as described in Section 3.2.12, was $29,292,987 in 2002 (Grant County 2003).

A report prepared by the Western Economic Analysis Center, Arizona (as cited in BLM 1997), estimates that secondary multiplier effects within Grant County, generated by Phelps Dodge

direct payments, are estimated to be approximately 80 percent of the direct effects. Accordingly, the total direct and secondary economic impacts of Phelps Dodge's Tyrone Branch to Grant County was approximately $52,727,376 in 2002.

Environmental Justice

No environmental justice issues have been identified for the project, as the project would not have a disproportionate impact on minority or low-income populations. There would be a positive effect on employment and income to minority PDTI workers who may be provided work by the project.

Proposed Action

The Proposed Action would continue mining at the Tyrone Mine for up to 4 more years, providing local employment and continuing the direct and secondary monetary benefits to the county. Since the overall number of workers involved in the pit expansion project is relatively low (24 workers), and the duration of the project is relatively short (up to 4 years), impacts of the Proposed Action is not a major impact at a county or State level. However, unemployment and percent of individuals below the poverty level in Grant County are high relative to national averages, and sources of employment, regardless of the number of workers or duration of the work, would have a beneficial effect on the general socioeconomic conditions currently being experienced in the local community.

No Action

Under the No Action Alternative, work provided by the pit expansion project would not occur. Should the expansion project not occur, the existing workers would be utilized elsewhere in the Tyrone Mine.

4.2 CUMULATIVE IMPACTS

Cumulative impact as defined by the Council on Environmental Quality (40 CFR 1508.7) is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). These reasonably foreseeable future actions refer to future action projections, or estimates, of what is likely to take place when a given proposed action is implemented. They are not part of the proposed action, but are projections being made so that future impacts, cumulative and otherwise, can be estimated as required by NEPA. Cumulative impacts are interdisciplinary, multi-jurisdictional, and do not conform to political boundaries. Cumulative impacts are the total effect on a given resource or ecosystem of all actions taken or proposed.

The geographic area considered for the analysis of cumulative impacts of the proposed Copper Mountain South Pit Expansion Project is delineated to include the Tyrone Mine area, the proposed Little Rock Mine area, California Gulch, Deadman Canyon, Whitewater Canyon, and portions of the Oak Grove Creek and Upper Mangas Creek watersheds. The cumulative analysis

also includes additional areas for socioeconomic analysis and special status species. The total area encompasses 12,945 acres of which 4,585 acres are currently undisturbed.

The historic, current, and projected amounts of ground disturbance in the cumulative analysis area are documented in Table 4-2. The increase of disturbance projected as a result of the proposed Copper Mountain South Pit Expansion would be 31.1 acres. This accounts for less than one percent of existing or proposed surface disturbance within the cumulative analysis area.

Lands and Access

Cumulative impacts to land use and access from the proposed expansion project are expected to be minimal. The proposed project is located within an area that is open for mineral development. Utilization of the proposed land for mining purposes does not conflict with local land use plans or regulations. Land use within the 31.1 acres would be changed from vacant, undeveloped land that is utilized by wildlife, to land utilized for mineral development. Mining of the pit expansion would contribute to an enlargement of an area that is limited in possibilities for any other future use because of past and present mining activities. The reclamation plan is designed to provide wildlife habitat.

Previous mining activities since the late 1800's, combined with current mining operations in the vicinity of the study area, contribute to the current status of ground disturbance and limited land uses. The expansion of the Copper Mountain Pit would cause minor impacts to the landscape, primarily due to cumulative effects with disturbance from previous mining at the site and existing mine operations in the study.

Access into the expansion area would be through the existing Copper Mountain Mine. No cumulative impacts are expected to the access or transportation system from the pit expansion.

Geology and Minerals

The first recorded mining activities in the Copper Mountain area date back to the early 1880's. In 1909, Phelps Dodge Mining Company consolidated about 150 mining companies that operated in the area at the time. In 1921 underground operations ceased. In the late 1940's a drilling program defined the Tyrone ore body. Overburden stripping began in 1967 with open pit mining commencing in 1969. Approximately 300 million tons of ore grading 0.81% Cu was processed by the concentrator at Tyrone from 1969 to 1992. In addition, another 425 million tons of ore has been leached prior to 1995. Copper reserves occur primarily as copper oxides. Copper sulfide material is present but will not be mined. Tyrone currently uses solvent extraction-electrowinning (SX-EW) to produce copper from the Tyrone Mine.

The proposed action would result in the removal of approximately 36 million tons of copper ore and 27 million tons of waste rock. Since 1990, 71 million tons of copper ore and 16 million tons of waste rock have been mined from the Copper Mountain Pit. The expansion of the pit, and past mining activities, would result in the cumulative removal of 107 million tons of copper ore from the mineral ore reserves at the Copper Mountain Pit.

Table 4-2
CURRENT AND PROJECT SURFACE DISTURBANCE IN CUMULATIVE ANALYSIS AREA
(in acres)

Facility	Current			Projected Change			Total (by area)			Cumulative Total
	Tyrone	Little Rock	Copper Mountain Expansion	Tyrone	Little Rock	Copper Mountain Expansion	Tyrone	Little Rock	Copper Mountain Expansion	
Proposed Copper Mountain Expansion Project										
Previous disturbance (existing stockpiles and roads)	–	–	10	–	–	–	–	–	10	10
Remaining pit expansion area	–	–	–	–	–	21	–	–	21	21
Total Copper Mountain Expansion Disturbed Area			**10**			**21**			**31**	**31**
Little Rock Mine Proposed Project Action										
Previous disturbance (existing stockpiles)	–	60	–	–	–	–	–	60	–	60
Little Rock Mine pit	–	63	–	–	123	–	–	186	–	186
Proposed waste stockpile	–	–	–	143	–	–	143	–	–	143
Proposed haul road and other facilities	–	–	–	8	32	–	8	32	–	40
Total Little Rock Mine Disturbed Area		**123**		**151**	**155**		**151**	**278**		**429**
Tyrone Mine										
Copper Mountain pit	102	–	–	–	–	–	102	–	–	102
San Salvador Hill pit	172	–	–	–	–	–	172	–	–	172
Gettysburg South pit	195	–	–	–	–	–	195	–	–	195
Valencia - West Main - M pits	758	–	–	–	–	–	758	–	–	758
Plant Area	648	–	–	–	–	–	648	–	–	648
Subtotal	1,875						1,875			1,875
No. 1 stockpile	175	–	–	–	–	–	175	–	–	175
No. 1A, B, C stockpiles	437	–	–	–	–	–	437	–	–	437
No. 2A/2B stockpile	449	–	–	–	–	–	449	–	–	449
No. 2C stockpile	177	–	–	–	–	–	177	–	–	177
No. 3 stockpile	430	–	–	–	–	–	430	–	–	430
No. 4 stockpile	380	–	–	–	–	–	380	–	–	380
No. 5 stockpile	282	–	–	–	–	–	282	–	–	282
No. 6 stockpile	232	–	–	–	–	–	232	–	–	232
No. 7 stockpile	346	–	–	157	–	–	503	–	–	503
No. 8 stockpile	146	–	–	–	–	–	146	–	–	146
Subtotal	3,053			157			3,210			3,210
Tailing Dam 1	407	–	–	–	–	–	407	–	–	407
Tailing Dam 1A	402	–	–	–	–	–	402	–	–	402
Tailing Dam 1X	577	–	–	–	–	–	577	–	–	577
Tailing Dam 2	466	–	–	–	–	–	466	–	–	466
Tailing Dam 3	579	–	–	–	–	–	579	–	–	579
Tailing Dam 3X	325	–	–	–	–	–	325	–	–	325
BMCC tailing dam	59	–	–	–	–	–	59	–	–	59
Subtotal	2,815						2,815			2,815
Total Tyrone Mine Disturbed Area	**7,742**			**157**			**7,900**			**7,900**
All Mine Areas										
Total Undisturbed Area	**4,621**	**427**	**21**	**(308)**	**(155)**	**(21)**	**4,313**	**272**	**0**	**4,585**
Total Disturbed Area	**7,742**	**123**	**10**	**308**	**155**	**21**	**8,051**	**278**	**31**	**8,360**

Source: Phelps Dodge Mining Co. 1997

Soils

Potential impacts to soils as a result of mining and related activities include increased rates of soil erosion by wind or water, increased compaction from haul vehicles, loss of topsoil, and decrease in soil productivity due to soil mixing. Past mining activity has resulted in increased soil compaction and erosion, and decreased soil productivity at the Tyrone Mine. Of the 12,945 acres in the cumulative analysis area, 8,360 acres have been disturbed by mining activities. The expansion of the Copper Mountain Pit (31.1 acres) would result in a less than 1 percent increase of the total disturbed area at the Tyrone Mine.

Within the Copper Mountain South Pit boundary, the soils are generally classified as rock-outcrop or disturbed land, with low productivity. What soil there is would mostly be removed with the waste rock and used as fill in the San Salvador Hill Pit. Long-term soil productivity would be reduced for the project area since soils in the proposed pit would be removed and soils used to potentially backfill the pit would have mixed horizons and be combined with wasterock material. Decreased productivity due to soil mixing affects the vegetation supported in the area.

Future impacts to soils at the Tyrone Mine may result from implementation of the Little Rock Mine Project. This project would impact 155 acres, including pit expansion and construction of a haul road and other facilities. Soils would be impacted by soil mixing, removal of soil, and potential for increased soil erosion in disturbed areas until reclamation is successfully completed. A portion of this disturbed soil may be stockpiled for use during reclamation. Some of these impacts would be successfully mitigated by implementing the reclamation and closure/closeout plans.

Water

Pit construction would divert an estimated 1 to 2 acre-feet/year stormwater flow from a portion of the Deadman Creek watershed into the pit. This in turn would reduce the potential tributary input to Mangas Creek and the Gila River by the same amount. Water use for the mine would be minimized and Phelps Dodge currently has enough water rights to meet their needs for the mine expansion. The proposed project would not cause an increase in the withdrawal rate of water from the Gila River above the current levels of use for processing mined materials at the Tyrone site.

Groundwater withdrawal during pit dewatering would temporarily drop groundwater levels close to the pit. No residential wells or municipal water supplies would be affected by pit dewatering. No springs or seeps are expected to be affected by the project.

Overall surface and ground water quality may improve due to removal of the historic leach stockpile. Evidence from laboratory and modeling analyses show that exposure of rock faces during mining would not cause acid rock drainage to develop.

Processing of ore and storage of waste rock at the existing Tyrone operation would not add a substantial increment of cumulative impacts on water resources. Ore processing at Tyrone would continue to operate as authorized by regulatory agencies which require surface and groundwater monitoring and the operation must operate within the parameters established by operational permits.

Air

The primary air quality issue for the pit expansion project would be airborne particulate matter. Sources of fugitive dust would be limited to areas disturbed during mining activities. Pollutants emitted by fuel-burning trucks and equipment is expected to be minimal and limited to the life of the mine and during operational hours. PDTI's mining operations are in compliance with Federal and State air quality regulations. The proposed extension is covered under the current Title V permit No. P147 and will not require modifications to existing air permits or any additional air quality permits. Cumulative air quality impacts are not predicted to occur.

Noise

The noise impact assessment for the Little Rock Mine EIS included a study area that encompassed the Copper Mountain South Pit Expansion area. The results of the assessment are considered to be generally applicable to the proposed expansion area due to the proximity of the Little Rock Mine to the Copper Mountain Pit, and the similar nature of noise generating activities at both locations.

Noise from earth moving equipment in the Little Rock Mine EIS was expected to be below estimated ambient noise levels and inaudible to all receptor locations except the two, nearby residential units. Receptors at the Little Rock Mine were considerably closer (3,000 feet to closest residence) than the closest receptor at the Copper Mountain South Pit Expansion (7,900 feet). Cumulative noise impacts at these receptors are not predicted.

A few hundred feet away from the pit and haul road, noise levels would be significantly less than those shown to have potentially adverse effects on some wildlife, and impacts are expected to be minimal and short term. No substantial changes in noise levels would result from the proposed pit expansion.

Vegetation

The vegetation in the project area consists of piñon-juniper woodlands, disturbed areas and intergradations of these types. No riparian habitat exists. Overall, the proposed pit expansion would result in the additional loss of vegetation and associated habitat. Potential impacts to vegetation caused by the proposed project are associated with construction activities and closure of the mine. Ground disturbance impacts occurring as a result of the expansion of the pit includes the direct loss of vegetation covering approximately 31.1 acres. The loss of this amount of vegetation habitat in the vicinity of the mine represents less than one percent of the cumulative analysis area. In addition, the area of new disturbance is adjacent to 7,900 acres that have been previously disturbed by mining activity, and the loss would have a minimal impact on the integrity of the area. Approximately 9 acres in the project area will be revegetated during reclamation.

Future impacts to vegetation at the Tyrone Mine may result from implementation of the Little Rock Mine Project. This project would impact approximately 155 acres of vegetation within the project area. Vegetation communities potentially impacted by the Little Rock Mine Project include: ponderosa pine forest, piñon -juniper woodland/chaparral, and grassland. Some of these impacts would be successfully mitigated by implementing the reclamation and closure/ closeout plans.

Wildlife

Wildlife in the vicinity of the existing mine includes big game species, small mammals, diverse avifauna, and reptiles. The proposed action would result in the cumulative loss of approximately 31.1 acres of habitat for wildlife. The proposed expansion area is adjacent to 7,900 of disturbed land, and the loss of this habitat would not result in additional fragmentation in the area. The cumulative analysis area includes 5,075 acres of undisturbed habitat. The loss of the proposed 31.1 acres would result in a loss of less than one percent of the total undisturbed area. Approximately 9 acres in the project area will be revegetated during reclamation and will return to a wildlife habitat post mining land use

Past mining activities have greatly modified the original vegetation and wildlife habitats of the project area. Present and future mining activities may have minor adverse cumulative effects to the available wildlife habitat present. The Little Rock Mine Project would affect approximately 130 acres of vegetated habitat. Most impacts to wildlife would be temporary during the operation of the mine. Implementation of the Tyrone Mine Closure/Closeout Plan will result in increased vegetation, and over time wildlife will begin to inhabit the area.

Special Status Species

Cumulative impacts to special status species are considered to be negligible. No significant unavoidable adverse effects would result to special status species as a result of the proposed alternatives for the Copper Mountain South Pit Expansion Project or for the Little Rock Mine Project (BLM 1997). Several special status species have the potential to occur in the vicinity of these projects, although known locations of such species do not exist on the proposed sites. It is likely that past mining activities impacted special status species, especially the Green-flowered pincushion cactus. However, the current project would not contribute to that impact.

Cultural and Paleontological Resources

An intensive survey for cultural resources by Human Systems Research, Inc. was performed in March 2002. One historic site was located on private land, and three isolated occurrences, including a horseshoe and prospect pits, were recorded. The prospect pits are on BLM lands, but outside the area that will be impacted by mining or reclamation operations. None of the resources were recommended as eligible for the NRHP. The project is not expected to impact any cultural resources; therefore, the project will not contribute any cumulative impacts.

Visual Resources

Cumulative visual impacts would be long-term modifications to the local setting caused by constructing of the proposed project. The project would create an additional 31.1 acres of visual impact in addition to the 7,900 acres of visual impact that have already occurred from the Tyrone Mine complex. The visual impact from the pit expansion appears to be minimal in relation to the areas already disturbed; however, it contributes to the cumulative impact mining has had on the on the natural scenery of the regional landscape.

Socioeconomics

The pit expansion is likely to contribute a positive cumulative impact in the local socioeconomic structure. Local communities are affected by the income, expenditures, and tax money mining provides. This includes not only the Copper Mountain Pit and the Tyrone Mine, but all other PD mines in the county including the Chino and Cobre mines. The pit expansion allows for the continuation of mining and employment at the Copper Mountain Pit for about 4 years. If the pit expansion is not approved, a portion of the copper resource owned by PD shareholders would be lost and the economic life of the operation would be shortened.

4.3 MITIGATION MEASURES

The MPO/CCP includes actions that will mitigate potential impacts to the environment. The following mitigations are in addition to MPO/CCP mitigation, and will further reduce the potential for environmental impacts:

Noxious Weeds

- Noxious weeds observed in and near the mine site at the start of operations will be treated with herbicides or physically removed to prevent seeds blowing into disturbed areas during mining operations.
- Periodic surveys will take place during the mining operation period to identify and treat noxious weeds that have developed.
- Fertilizer will not be used in seeded areas, because it can enhance the growth of noxious weeds at the expense of desired vegetation.
- Certified weed-free mulch will be used for reclamation, and weed-free straw bales will be used for sediment barriers. Topsoil or growth-medium used for reclamation will be assessed for presence and abundance of noxious weeds. Medium must be from weed-free sources or be treated by spraying to prevent seed establishment.

Special Status Species

- Upon discovery of any special status plant, PDTI will inform the BLM authorized officer (special status plants specialist), who will coordinate any mitigation, such as transplanting, that is undertaken.
- Should any underground openings be encountered during mining, PDTI will notify the NMGF in addition to MMD and the BLM. Potential bat mitigation may include bat surveys and the installation of bat-friendly gates.
- If nesting raptors are found, land clearing activities would be timed to avoid the breeding season to avoid impacts to active nests, and a depredation permit would be obtained from USFWS for land clearing to permit the take of inactive nests.

Water Use

- Other substances, such as lignites, may be used for dust control as an alternative to water.

Monitoring

- PDTI will conduct an annual review of acid producing material in the pit walls and will prepare assessment/alternative plans to address the issue if necessary.

4.4 RESIDUAL IMPACTS

Residual impacts are those that remain following the implementation of mitigation measures, or impacts for which there are no applicable mitigation measures. The majority of the impacts are temporary, construction and operation related impacts. The no-action alternative would also result in residual impacts to water quality because of the discharges from the leach stockpiles that remain from previous mining in the permit area. These leach stockpiles will be removed as a source of contaminants by implementation of the proposed action. The MPO/CCP and associated mitigation measures will reduce anticipated impacts and potentially eliminate some unavoidable adverse effects.

Unavoidable residual impacts that may occur from the proposed action, and would remain following mitigation, are summarized below for the affected resources.

No residual impacts are anticipated for lands and access, air, noise, special status species, cultural and paleontological resources, and socioeconomics.

Geology and Minerals

The removal of approximately 36 million tons of copper ore and 27 million tons of waste rock would disturb approximately 31.1 acres of ground surface. Implementation of the project would result in the permanent establishment of an open pit of considerable size that would remain after reclamation processes are completed. Mined copper ore will be permanently removed from within the 31.1 acre area and will not be available for future use.

Soils

The soil resource will be impacted within the Copper Mountain South Pit Expansion Area. The limited amount of soil located within the project area would generally be removed and used to partially backfill the San Salvador Hill Pit and will not be available for reclamation purposes at the Copper Mountain South Pit Expansion. If salvageable amounts of topsoil are encountered in the development area, it would be stockpiled for use in reclamation.

Water Resources

The Copper Mountain South Pit Expansion would prevent approximately 1-2 acre-feet/year of water from flowing into Deadman Canyon. The permanent change of the topography in the expansion area would result in this water being directed toward the Copper Mountain Pit instead of Deadman Canyon. The project will also use water for watering roads for dust suppression.

Removal of existing leach stockpiles may have a positive effect on surface water and groundwater quality.

Vegetation

The proposed action would result in the loss of 8.2 acres of mixed woodland, 18.7 acres of mixed woodland-disturbed/successional mosaic, and 4.2 acres of disturbed/successional vegetation communities. The reclamation revegetation seed mix consists of grasses, shrubs, and forbs, and it is unlikely that tree species will rapidly vegetate the area.

Wildlife

There will be a loss of wildlife habitat associated with the mixed woodland and mosaic vegetation communities. The proposed action will result in the loss of approximately 26.9 acres of these vegetation communities combined. However, reclaimed areas will provide habitat for grassland species and for those species that previously inhabited the disturbed/successional vegetation community. The revegetated areas within the pit expansion will total approximately 9 acres.

Visual Resources

Visual quality would change as a result of the Copper Mountain South Pit Expansion. Enlarging the open mine pit would cause residual impacts to the landscape, primarily due to the cumulative effects with disturbance from previous mining. The excavated pit will remain after reclamation, permanently impacting the landscape form.

4.5 CRITICAL ELEMENTS

The BLM NEPA Handbook (H-1790-1) identifies several environmental elements that are subject to requirements specified in statutes or executive orders that must be addressed in all BLM environmental assessments. Table 4-3 lists these "critical elements" and identifies where they have been addressed in the document.

Table 4-3
CRITICAL ELEMENTS

Critical Element	Location in Document	Comment
Air Quality	Sections 2.1.2; 3.2.5; 4.1.5	Project area is in an attainment area
Areas of Critical Environmental Concern (ACECs)	Section 3.1	No ACECs in project area
Cultural Resources	Sections 3.2.10; 4.1.10	One historic site recommended as not eligible to the National Register of Historic Places
Farm Lands (Prime or Unique)	Section 3.1	No prime or unique farmlands in project area
Floodplains	Section 3.1	No floodplains in project area
Native American Religious Concerns	Sections 3.2.10; 4.1.10	No Native American religious concerns identified
Threatened or Endangered Species	Sections 3.2.9; 4.1.9	No significant unavoidable impacts to special status species
Wastes, Hazardous or Solid	Section 2.1.2; 2.1.5	No hazardous material stored in the pit expansion area

Table 4-3
CRITICAL ELEMENTS

Critical Element	Location in Document	Comment
Water Quality, Surface & Ground	Sections 3.2.4; 4.1.4	Water quality expected to improve with removal of historic leach stockpile
Wetlands/Riparian Zones	Section 3.2.7	No wetlands or riparian zones in project area
Wild and Scenic Rivers	Section 3.1	No Wild and Scenic Rivers in project area
Wilderness	Section 3.1	No wilderness in project area
Invasive, Nonnative Species	Sections 3.2.7; 4.1.7; 4.3	No noxious weeds identified during plant survey; preventative measures included in mitigation
Environmental Justice	Section 4.1.12	No environmental justice issues identified with proposed action

5.1 PUBLIC INVOLVEMENT

Public involvement activities for the proposed project have included mailings, media notices, informal contacts, and consultation with other agencies. A project website has also been available at www.nm.blm.gov that contains general information on the project, the Copper Mountain South Pit Expansion MPO/CCP, and notices and updates on the project.

A 30-day public scoping/comment period was held between August 23 and September 23, 2004. On August 19, 2004, the BLM mailed a public scoping letter, a scoping notice that described the proposed action, and a comment form to potentially interested parties. The scoping notice provided information on the BLM project website, where additional project information could be reviewed. Eighty-nine mailings were sent out to private citizens and Federal, State, and local agencies. The BLM received two comments on the proposed project, one from the State of New Mexico Department of Game and Fish (NMGF), and one internal BLM comment.

The NMGF provided four comments on the proposed project and the MPO/CCP.

- **Comment:** The first comment requested a wording change to explain that the perimeter fencing to be installed around the mine expansion area is not meant to exclude wildlife, but to minimize potential for injury to wildlife crossing over or under the fencing. Additionally, the commentor suggested that wildlife be excluded from any hazardous conditions within the fenced area.

  Response: Section 2.1.2 of the EA provides the corrected wording regarding the purpose of fencing. It is expected that wildlife will avoid mining areas, however, PDTI will monitor conditions and respond to wildlife issues should they occur. Response may include fencing that would exclude wildlife from hazardous conditions.

- **Comment:** The second comment suggested that in order to minimize water use, PDTI should consider the use of other dust suppression substances, such as lignites.

  Response: Section 2.1.2, Mine Dust Control, now includes other substances such as lignites as potential options for dust suppression at the mine.

- **Comment:** The third comment indicated that there were three non-native species in the proposed reclamation seed mix.

  Response: The seed mix has been revised to remove all non-native species.

- **Comment:** The fourth comment was concerned with historic mine openings and the potential for use by bats.

  Response: Of the four known underground openings, none are within the proposed disturbance area of the project. To address the potential human safety issue, PDTI has committed to fencing the entrances to restrict human access. Should any openings be encountered during mining, PDTI has also committed to conducting a bat survey before closing any historic mine openings, and installing bat-friendly gates after consultation with the NMGF.

The one comment received from a BLM reviewer was that Map 6 of the MPO/CCP, Revegetation Reference Map, was confusing and mis-identified the Copper Mountain expansion area as the Little Rock Mine. The area identified as the Little Rock Mine on Map 6 is correct.

The purpose of the map is to identify the revegetation reference area that is used as a standard for judging revegetation success at the Tyrone Mine. See Section 3.10.2 of the MPO/CCP.

Table 5-1
PERSONS AND AGENCIES CONSULTED

Agency	Name	Comments
University of New Mexico, Natural Heritage Program	Rayo McCollough, Information Coordinator	Records of northern goshawk and copper mine milkvetch have been found within approximately 3,600 feet of the project area.
University of New Mexico, Natural Heritage Program	Rayo McCollough	Special status species list
New Mexico Environment Department	Surface Water Quality Bureau, Ground Water Quality Bureau, Air Quality Bureau	Bureaus consulted on permit requirements, data records
New Mexico Energy, Minerals, and Natural Resources Department – Mineral Mining Division	David Ohori	MMD has responsibility of reviewing and approving the Mine Plan of Operations and Closure Closeout Plan. MMD also issues the mine permit and determines adequacy of financial assurances.
New Mexico Department of Game and Fish	Lisa Kirkpatrick	Consultation on state species of concern and general wildlife issues associated with the proposed project
State Historic Preservation Office (SHPO)	Philip A. Young	SHPO consultation, compliance with Section 106
Native American Tribes	White Mountain Apache Tribe, Fort Sill Apache Tribe of Oklahoma, Navajo Nation, Hopi Tribal Council, Ysleta del Sur Pueblo, Comanche Indian Tribe	Tribal consultation
New Mexico Department of Agriculture	Frannie Miller	State noxious weed list
New Mexico Grant County Extension Service	Ron Lamb	Grant County noxious weed list
Grant County	Grant County Treasurer	Economic data
Town of Silver City	Town of Silver City Administration	Economic Data

5.2 LIST OF PREPARERS AND REVIEWERS

Table 5-2 lists the responsibilities, education, and experience of the people who prepared and reviewed this Environmental Assessment (EA). URS Corporation is the primary consultant responsible for environmental studies and EA preparation. The table also lists the BLM personnel who are responsible for project oversight and EA review.

Table 5-2
LIST OF PREPARERS AND REVIEWERS

Name & Title	EA Responsibility	Education & Certification	Experience
U.S. Bureau of Land Management			
Buzz Todd *Geologist*	Team Coordinator, Minerals, Noise	B.A. Geology	10 years of experience in mine permitting
Ray Aguilar *Range Management Specialist*	Vegetation, Livestock Grazing, Noxious Weeds	B.S. Range Science	22 years of experience in range management
Bruce Call *Soil Scientist*	Soils, Air Quality, Water Resources	B.S. Range/Soil Science	25 years of experience in natural resource management
Tom Custer *Physical Scientist*	Hazardous Materials	B.S. Geology	12 years of experience in hazardous materials
Bill Gilbert *Natural Resource Specialist*	NEPA Compliance, Socioeconomics	B.S. Biology	23 years of experience in planning and environmental coordination
Oz Gomez *Outdoor Recreation Specialist*	Recreation, Visual Resources	B.S. Biology	30 years of experience in recreation and natural resource management
Mark Gunn *Hydrologist*	Water Resources	B.S. Geology M.S. Hydrology	7 years of experience in hydrology
Bill Merhege *Wildlife Management Biologist*	Wildlife, Special Status Animals	B.S. Wildlife Science	23 years of experience in wildlife management
Sheila Richmond *Botanist*	Special Status Plants	B.S. Botany	10 years of experience in botany
Phil Rhinehart *Realty Specialist*	Lands, Access	B.A. English	2 years of experience in lands and realty
John Thacker *Archaeologist*	Cultural and Paleontological Resources	B.A. Anthropology	20 years of experience in cultural resource management and archaeology
Tim Sanders *Supervisor – Lands and Minerals*	Management Oversight	M.S. Agricultural Economics	24 years of experience in resource management
URS Corporation			
Bill Killam *Project Manager*	Project Manager, Cultural and Paleontological Resources	B.A. Sociology/Anthropology	30 years of experience in cultural resources, environmental planning, and assessment
Holly Barnard *Environmental Scientist/ Ecologist*	Soils, Vegetation, Wildlife and Fisheries, Special Status Species, Mitigation, Consultation and Coordination, References	M.S. Forest Science B.S. Forest Resources	5 years of experience in ecology
David Jones *Senior Environmental Planner*	Introduction, Proposed Action and Alternatives, Lands and Access, Minerals, Water, Air, Noise, Recreation, Visual Resources, Socioeconomics, and Critical Elements	B.S. Landscape Planning	14 years of experience in environmental assessment and land use planning
Jessica Myklebust *Environmental Scientist*	Impacts, Mitigation Measures, Cumulative Impacts, and Residual Impacts for Lands and Access, Geology and Minerals, Air, Noise, Visual Resources and Socioeconomics	B.S. Environmental Science	4 years experience in environmental assessment
Brenda Miller *Technical Editor*	Document Editing	B.A. Journalism	16 years of experience in technical writing and editing.

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Appendix A
Species List

BIRDS
Permanent Resident and Breeding Birds likely to be Found in the Vicinity of the Copper Mountain Expansion Area[1,2]

Species		Habitat Type
Common Name	Scientific Name	
FALCONIFORMES		
*Turkey Vulture	*Cathatres aura*	piñon-juniper, grasslands
*Cooper's Hawk	*Accipiter cooperii*	ponderosa pine, piñon-juniper
*Red-tailed Hawk	*Buteo jamaicensis*	all types
*American Kestrel	*Falco sparverius*	piñon-juniper, grasslands
COLUMBIFORMES		
Band-tailed Pigeon	Columba fasciata	ponderosa pine, piñon-juniper
*Mourning Dove	*Zenaida macroura*	all habitat types
CUCULIFORMES		
Greater Roadrunner	*Geococcyx californianus*	piñon-juniper, grasslands
STRIGIFORMES		
Barn Owl	*Tyto alba*	piñon-juniper, grasslands
Western Screech-Owl	*Otus kennicottii*	piñon-juniper, grasslands
*Great Horned Owl	*Bubo virginianus*	all habitat types
CAPRIMULGIFORMES		
Common Poorwill	*Phalaenoptilus nuttallii*	piñon-juniper, grasslands
Whip-poor-will	*Caprimulgus vociferus*	piñon-juniper
APODIFORMES		
Black-chinned Hummingbird	*Archilochus alexandri*	piñon-juniper, grasslands, riparian
PICIFORMES		
*Acorn Woodpecker	*Melanerpes formicivorus*	ponderosa pine, piñon-juniper
PASSERIFORMES		
Tyrannidae – Tyrant Flycatchers		
Western Wood-Pewee	Contopus sordidulus	ponderosa pine, piñon-juniper, riparian
Say's Phoebe	*Sayornis saya*	piñon-juniper, grasslands
*Ash-throated Flycatcher	*Myiarchus cinerascens*	piñon-juniper, grasslands
Cassin's Kingbird	*Tyrannus vociferans*	ponderosa pine, piñon-juniper, riparian
Corvidae – Jays and Crows		
*Scrub Jay	*Aphelocoma coerulescens*	ponderosa pine, piñon-juniper
*Gray-breasted Jay	*A. ultramarina*	piñon-juniper, chaparral
*Common Raven	*Corvus corax*	all habitat types
Paridae – Chickadees, Titmice		
*Bridled Titmouse	Baeolophus wollweberi phillipsi	piñon-juniper
*Plain Titmouse	B. inornatus	piñon-juniper
Aegithalidae – Bushtits		
*Bushtit	*Psaltriparus minimus*	piñon-juniper
Sittidae – Nuthatches		
*White-breasted Nuthatch	*Sitta carolinensis*	ponderosa pine, piñon-juniper
Troglodytidae – Wrens		
*Bewick's Wren	*Thryomanes bewickii*	piñon-juniper, grasslands
*House Wren	*Troglodytes aedon*	ponderosa pine, piñon-juniper
Muscicapidae – Old World Warblers		
Blue-gray Gnatcatcher	*Polioptila caerulea*	piñon-juniper, grasslands, riparian
Western Bluebird	*Sialia mexicana*	ponderosa pine, piñon-juniper, grasslands
Mimidae – Mockingbirds and allies		
Crissal Thrasher	*Toxostoma crissale*	piñon-juniper
Ptilogonatidae – Silky-flycatchers		
Phainopepla	*Phainopepla nitens*	piñon-juniper, grasslands, riparian
Lannidae – Shrikes		
Loggerhead Shrike	*Lanius ludovicianus*	piñon-juniper, grasslands

BIRDS
Permanent Resident and Breeding Birds likely to be Found in the Vicinity of the Copper Mountain Expansion Area[1,2]

Species		Habitat Type
Common Name	Scientific Name	
Vireonidae – Vireos		
Gray Vireo	*Vireo vicinior*	piñon-juniper
*Solitary Vireo	*V. solitarius*	ponderosa pine, piñon-juniper
*Hutton's Vireo	*V. huttoni*	chaparral
Emberizidae – Warblers, New World Finches, and allies		
Virginia's Warbler	*Vermivora virginiae*	ponderosa pine, piñon-juniper, riparian
*Black-throated Gray Warbler	*D. nigrescens*	piñon-juniper, ponderosa pine
Hepatic Tanager	*Prianga flava*	piñon-juniper, ponderosa pine, riparian
Western Tanager	*P. ludoviciana*	ponderosa pine, chaparral, piñon-juniper
*Black-headed Grosbeak	*Pheucticus melanocephalus*	piñon-juniper, pine-oak
Blue Grosbeak	*Guiraca caerulea*	grasslands, chaparral, piñon-juniper
*Rufous-sided Towhee	*Piplo erythrophthalmus*	chaparral, riparian
*Canyon, or Brown, Towhee	*P. fuscus*	chaparral, riparian
*Chipping Sparrow	*Spizella passerina*	chaparral, pine-oak
*Black-chinned Sparrow	*S. atrogularis*	chaparral, grasslands
*Brown-headed Cowbird	*Molothrus ater*	woodlands (forest edge)
Fringillidae – Old World Finches and allies		
*House Finch	*Carpodacus mexicanus*	semiarid lowlands
*Lesser Goldfinch	*Carduelis psaltria*	dry fields, edge habitat

[1]Sources: Hubbard 1970, Russell 1990, UNM 2002.
[2]*= Species presence was verified by Metric Corporation (1993).

MAMMALS
Mammals Known or likely to Occur in the Vicinity of Copper Mountain Expansion Area in Grant County, New Mexico[1,2]

Common Name	Scientific Name
CHIROPTERA: Bats	
Yuma Myotis	*Myotis yumanensis*
Little Brown Myotis	*M. lucifugus*
Fringed Myotis	*M. thysanodes*
California Myotis	*M. californicus*
Small-footed Myotis	*M. leibii*
Silver-haired Bat	*Lasionycteris noctivagans*
Western pipistrelle	*Pipistrellus hesperus*
Big Brown Bat	*Eptesicus fuscus*
Hoary Bat	*L. cinereus*
Spotted Bat	*Euderma maculatum*
Townsend's Big-eared Bat	*Plecotus townsendii*
American Free-tailed Bat	*Tadarida brasiliensis*
LAGOMORPHA: Rabbits, Hares, Pikas	
Eastern Cottontail	*Sylvilagus floridanus*
#* Desert Cottontail	*S. audubonii*
* Black-tailed Jackrabbit	*Lepus californicus*

MAMMALS
Mammals Known or likely to Occur in the Vicinity of Copper Mountain Expansion Area in Grant County, New Mexico[1,2]

Common Name	Scientific Name
RODENTIA: Rodents	
# Cliff Chipmunk	*Tamias dorsalis*
#* Rock Squirrel	*Spermophilus variegatus*
Botta's Pocket Gopher	*Thomomys bottae*
Western Harvest Mouse	*Reithrodontomys megalotis*
Deer Mouse	*Peromyscus maniculatus*
Brush Mouse	*P. boylii*
Pinyon Mouse	*P. truei*
Rock Mouse	*P. difficilis*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Hispid Cotton Rat	*Sigmodon hispidus*
# White-throated Wood Rat	*Neotoma albigula*
Stephen's Wood Rat	*N. stephensi*
Mexican Wood Rat	*N. mexicana*
Norway Rat	*Rattus norvegicus*
House Mouse	*Mus musculus*
Porcupine	*Erethizon dorsatum*
CARNIVORA: Carnivores	
#* Coyote	*Canis latrans*
* Gray Fox	Urocyon cinereoargenteus
* Black Bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Ringtail	*Bassaricus astutus*
Badger	*Taxidea taxus*
Western Spotted Skunk	*Spilogale gracilis*
Striped Skunk	*Mephitis mephitis*
Hog-nosed Skunk	*Conepatus mesoleucus*
# Mountain Lion	*Felis concolor*
Bobcat	*F. rufus*
ARTIODACTYLA: Even-toe Ungulates	
Collared Peccary	*Tayassu tajacu*
*# Mule Deer	Odocoileus hemionus
* White-tailed Deer	*O. virginianus*

[1]Sources: Bernard and Brown 1978, Findley et al. 1975, Whitaker, 1980, UNM 2002.
[2]* = Species presence was verified by Metric Corporation (1993).
= Species presence was verified by Dames and Moore (1994, 1995).

REPTILES AND AMPHIBIANS
Reptiles and Amphibians which may Occur in the Vicinity of the Copper Mountain Expansion Area.

Common Name	Scientific Name
SALAMANDERS	
Tiger Salamander	*Ambystoma tigrinum*
FROGS AND TOADS	
New Mexico Spadefoot (toad)	*Spea multiplicatus*
Arizona Toad or Southwestern Toad	*Bufo microscaphus*
Red-spotted Toad	*B. punctatus*
Woodhouse's Toad	*B. woodhousei*
Canyon Treefrog	*Hyla arenicolor*
Bullfrog	*Rana catesbeiana*
Lowland Leopard Frog	*R. yavapaiensis*
LIZARDS	
Lesser Earless Lizard	*Holbrookia maculata*
Collared Lizard	*Crotaphytus collaris*
Desert Spiny Lizard	Sceloporus magister
Clark's Spiny Lizard	*S. clarki*
Prairie or Plateau Lizard	*S. undulatus*
Tree Lizard	*Urosaurus ornatus*
Short-horned Lizard	*Phyrnosoma douglassi*
Great Plains Skink	*Eumeces obsoletus*
Chihuahuan Spotted Whiptail	*Cnemidophorus exsanguis*
Western Whiptail	*C. tigris*
Madrean Alligator Lizard	*Elgaria (=Gerrhonotus) kingii*
SNAKES	
Western Blind Snake	*Leptotyphlops humilis*
Ringneck Snake	*Diadophis punctatus*
Striped Whipsnake	Masticophis taeniatus
Big Bend Patch-nosed Snake	*Salvadora deserticola*
Mountain Patch-nosed Snake	*S. grahamiae*
Glossy Snake	*Arizona elegans*
Gopher Snake	*Pituophis melanoleucus*
Kingsnake (desert)	*Lampropeltis getulus*
Black-necked Garter Snake	*Thamnophis cyrtopsis*
Checkered Garter Snake	*T. arcianus*
Night Snake	*Hypsiglena torquata*
Western Diamondback Rattlesnake	*Crotalus atrox*
Banded Rock Rattlesnake	*C. lepidus klauberi*
Black-tailed Rattlesnake	*C. molossus*
Western Rattlesnake	*C. viridis*

Sources: Bernard and Brown 1978, Stebbins 1985, UNM 2002.